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FURUNO

SERVICE MANUAL

MARINE RADAR

MODEL 1721
MODEL 1731
MODEL 1751
MODEL 1761

FURUNO ELECTRIC CO., LTD.
NISHINOMIYA, JAPAN

930560T
(9305,tata)
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CHAPTER 1. GENERAL

GENERAL INFORMATION

This manual provides the informations necessary for the servicing and adjustment of the MODEL 1721/731/1751/1761 color radars.

The display unit is newly developed. The scanner units are used in other FURUNO radars.

The tables which follow list the pcbs contained in the display unit and parts and pcbs in the scanner unit.

Boards & Major Components

		Model 1721	Model 1731	Model 1751	Model 1761
DISPLAY UNIT	PROCESSOR Board	SPU-9046 S1: #1/#2=ON/ON JMP2: A	SPU-9046 S1: #1/#2=OFF/ON JMP2: B	SPU-9046 S1: #1/#2=ON/OFF JMP2: A	SPU-9046 S1: #1/#2=OFF/OFF JMP2: B
	POWER SUPPLY Board	PTU-9047	PTU-9048		
	FILTER Board	FIL-9049			
	PANEL Board	PNL-9043			
	POT. Board	VOL-9044			
	TRACKBALL Board	TB-9045			
SCANNER UNIT	MODULATOR Board	MD-9052	MD-7918C	MD-9052	MD-7918C
	IF AMP Board	RC-9052 (module)	IF-7758C (JP601: short)		IF-7758D (JP601: open)
	INTERFACE Board	—	—	03P8630A	—
	BEARING SIG GEN Board	—	—	—	MP-8070
	MIC Board	—	—	03P8658	MIC-8071
	MIC	S-RX25, A	RU-8015	S-RX25, A	RU-8014
	Magnetron	E3554(E3561) or MG5353	9M302/E3513	E3554(E3561) or MG5353	9M302/E3513
	Circulator/Limiter	FCX71	FCX73	FCX71	RC-4356
	Scanner Motor	RM-9086	RM-9087	RM-8629	RM-8025
CABLE	Signal Cable	RW-9079	RW-6537	RW-8577-1	RW-6537

SPECIFICATIONS

SCANNER UNIT

		Model 1721	Model 1731	Model 1751	Model 1761
Radiator Type		Microstrip	Slotted Waveguide Array		
Radiator Length		40 cm	54 cm	65 cm	100 cm
Horizontal Beamwidth		5.7°	4°	3.5°	2.4°
Vertical Beamwidth		30°	25°	30°	25°
Sidelobe Attenuation	Within ± 20° of mainlobe	– 20 dB or less	– 18 dB or less	– 20 dB or less	– 24 dB or less
	Outside ± 20° of mainlobe	– 25 dB or less	– 23 dB or less	– 25dB or less	– 30 dB or less
Polarization		Horizontal			
Antenna Rotation		24 rpm nominal			
Scanner Housing Structure		Radome		Exposed Radiator	
Compass Safe Distance	Standard	1.5 m	3.1 m	1.7 m	1.8 m
	Steering	1.1 m	1.75 m	1.3 m	1.35 m

TRANSCEIVER UNIT (contained in scanner housing)

	Model 1721	Model 1731	Model 1751	Model 1761
Transmitting Tube (Magnetron)	E3554 (E3561) or MG5353	9M302/E3513	E3554 (E3561) or MG5353	9M302/E3513
Frequency & Modulation	9410 MHz, P0N			
Peak Output Power	1.5 kW nominal	3 kW nominal	1.5 kW nominal	3 kW nominal
Pulse Length & Pulse Repetition Rate	0.12 us, 2100Hz approx. (Short Ranges: 0.25 - 1nm)			
	0.3 us, 1200Hz approx. (Medium Ranges: 1.5 - 3nm)			
	0.8 us, 600Hz approx. (Long Ranges: 4nm -)			
Modulator	FET Switch			
Duplexer	Circulator with diode limiter			
Receiver Front End	MIC (Microwave IC)			
Tuning	Automatic			
Intermediate Frequency	60 MHz			
Bandwidth	7 MHz			
Noise Figure	9 dB nominal			6 dB nominal

DISPLAY UNIT

		Model 1721	Model 1731	Model 1751	Model 1761
Indication System		PPI (Raster scan, Daylight display)			
Picture Tube		7-inch diagonal, green phospher CRT			
Range Scale (nm)		1721 → 1731/51 → 1761 →			
		0.25 0.5 0.75 1 1.5 2 3 4 6 8 12 16 24 36			
Range Ring Interval (nm)		0.125 0.125 0.25 0.25 0.5 0.5 1 1 2 2 3 4 6 6			
Number of Rings		2 4 3 4 3 4 3 4 3 4 4 4 4 6			
Bearing Resolution		6.2°	4.5°	4°	2.9°
Range Resolution		Better than 41m			
Bearing Accuracy		Better than 1°			
Minimum Range		Better than 39 m			
Range Ring Accuracy		0.9% or 8 m, whichever is the greater			
VRM Accuracy		0.9% or 8 m, whichever is the greater			
Mark Indication		Heading Mark, Bearing Scale, Range Ring, VRM, EBL, Tuning Bar, Alarm Zone, Cursor, Waypoint (option)			
Numeral/Character Indication		Range, Range Ring Interval, ST-BY, Rain Clutter Rejection (FTC), Interference Rejection (IR), Radar Alarm (GUARD), Echo Stretch (ES), Range & Bearing to Cursor ([ ), EBL, VRM, Plotting Interval & Elapsed Time (PLOT), Shift, Zoom, Watchman, Latitude/Longitude (L/L, option), Ship's Speed (SPD, option), Range & Bearing to Waypoint (WP, option), Compass Data (MAG or GYRO, option)			
Shift & Zoom		Built-in			
"Watchman" Mode		Selectable through menu			
Input/Output Terminals		NAV DATA (in): FURUNO CIF or NMEA 0183 GYRO (in): FURUNO clocked-serial (AD format) or NMEA0183 External Buzzer (out): +12V source plus Open Collector External Monitor (out): Video/H-sync/V-sync			
Compass Safe Distance	Standard	0.5 m			
	Steering	0.4 m			

ENVIRONMENTAL CONDITIONS

Ambient Temperature	ScannerUnit (-25℃ to + 70℃) Display Unit (-15℃ to +55℃)
Humidity	95% (RH) or less at +40℃
Vibration	<table><tr><th>Vibration Frequency</th><th>Total Amplitude</th></tr><tr><td>1 to 12.5 Hz</td><td>± 1.6mm</td></tr><tr><td>12.5 to 25 Hz</td><td>± 0.38mm</td></tr><tr><td>25 to 50 Hz</td><td>± 0.10mm</td></tr></table>

POWER SUPPLY & POWER CONSUMPTION

	Model 1721	**Model 1731**	**Model 1751**	**Model 1761**
DC Power	10.2VDC – 31.2VDC	10.2VDC – 40.0VDC		10.2VDC – 40.0VDC
	33W (TX) 18W (Economy)	47W (TX) 25W (Economy)		55W (TX) 25W (Economy)
AC Power	100/110/220/230VAC, 50/60Hz, 1 ϕ (separate rectifier required)			

CHAPTER 1. BLOCK DESCRIPTION

POWER SUPPLY CIRCUIT

Refer to the block diagram on page 2-3 or 2-6.

FILTER BOARD (FIL-9049)

Ship's mains voltage is first applied to the Filter Board. The board contains a line filter composed of L1 and C1 to block conduction noise to and from the radar system. CR1 connected across the mains input line is a reverse polarity protector to blow the line fuse (F1301) intentionally. The output of the filter board is fed to the Power Supply board.

POWER SUPPLY BOARD (PTU-9047) MODEL 1721

The power supply circuit is basically a PWM inverter and derives the isolated line voltages (+12V/+5V/-12V/ANT+12V/ANT-12V) from the mains input.

Power ON/OFF Control

K1 is a latching (bi-stable) relay which mechanically holds ON or OFF state by a momentary current through the SET or RESET winding. When the PWR switch is pressed alone, the power control logic U1 activates the SET winding of K1 to switch the relay on. To the contrary, when the PWR and TX keys are pressed simultaneously, the U1 activates the RESET winding to switch the relay off. In this manner, the momentary power switches (PWR/TX), together with K1/U1, work like a conventional toggle switch, keeping ON or OFF state even during mains power failure.

Primary Power Supply (+10V regulator)

When K1 is turned on, the mains input reaches the +10V regulator. The +10V regulator is a simple series-pass regulator and supplies power to the PWM controller (U3), the protection controller (U2) and other components working on the driver (primary) side of the inverter.

PWM inverter

When power is supplied to the PWM controller, it starts operation and turns on and off the switching FET (Q2) connected to the primary winding of T1. The resultant AC voltages obtained on the secondary windings are rectified and smoothed to +12V, +5V and -12V, and delivered to various circuits in the equipment. The voltage taken from the +12V line is fed back to the PWM controller through the voltage adjuster (VR1) and the photo-isolator (U4) to maintain the +12V output constant.

Scanner Motor Power (ANT+12V)

+12V (ANT+12V) is also used to drive 12V scanner motor. Transistor Q31 in the ANT+12V line switches on and off the motor power by the ANT SW signal from the processor board. To prevent the protector from tripping due to high starting current of the motor, Q31 is furnished with the soft-starter (C38/R40) to gradually increase its conductivity.
(Note that ANT -12V is not used as motor power in Model 1721.)

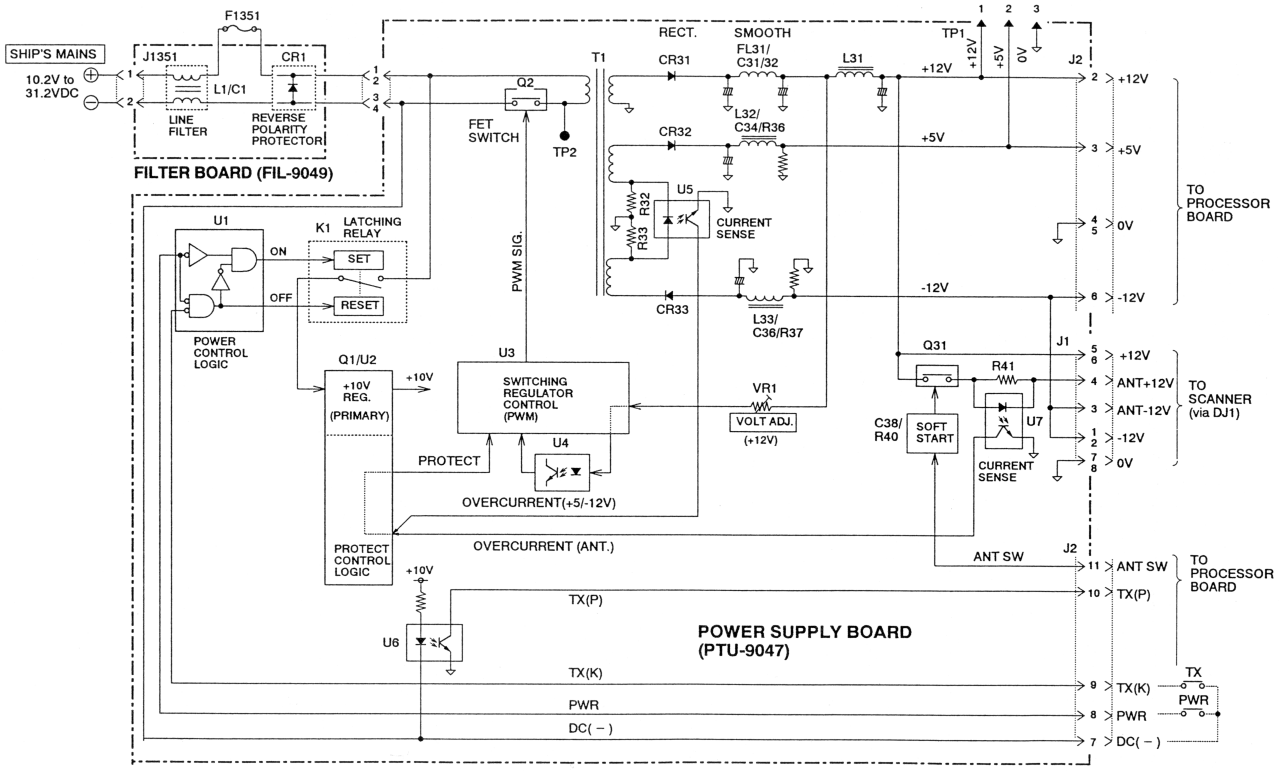
Protectors

Protection of power supply circuit is achieved by stopping the drive signal to the switching FET (Q2).

R32/R33 and U5 form an overcurrent detector for +5V and -12V lines. If the voltage drop across the current sensing resistors gets high enough, photo-isolator U5 becomes conductive and consequently disables the output of the PWM controller.

In the same manner, R41 and U7 detect overcurrent of scanner motor line and shut down the PWM inverter.

Overvoltage of mains input is detected by the comparator contained in U2. When the input voltage exceeds 31.2V, the comparator becomes active and disables PWM controller U3.


SHIP'S MAINS
10.2V to 31.2VDC
F1351
J1351
L1/C1
LINE FILTER
CR1
REVERSE POLARITY PROTECTOR
FILTER BOARD (FIL-9049)
Q2
FET SWITCH
TP2
T1
RECT.
SMOOTH
CR31
FL31/ C31/32
L31
CR32
L32/ C34/R36
CR33
L33/ C36/R37
TP1
+12V
+5V
0V
J2
+12V
+5V
0V
-12V
TO PROCESSOR BOARD
U5
R32
R33
CURRENT SENSE
U1
K1
LATCHING RELAY
ON
SET
OFF
RESET
POWER CONTROL LOGIC
PWM SIG.
Q1/U2
+10V REG. (PRIMARY)
+10V
U3
SWITCHING REGULATOR CONTROL (PWM)
VR1
VOLT ADJ. (+12V)
Q31
J1
R41
C38/ R40
SOFT START
U7
CURRENT SENSE
ANT+12V
ANT-12V
TO SCANNER (via DJ1)
PROTECT
U4
OVERCURRENT(+5/-12V)
OVERCURRENT (ANT.)
PROTECT CONTROL LOGIC
ANT SW
TX(P)
U6
POWER SUPPLY BOARD (PTU-9047)
TX(K)
PWR
DC(–)
TX
PWR

POWER SUPPLY BOARD (PTU-9048) for MODEL 1731/1751/1761

The power supply circuit basically consists of a main inverter and a sub inverter. The main inverter derives the isolated line voltages +12V/ANT+12V and -12V/ANT-12V from the mains input. The sub inverter derives +5V and +32V from +12V output of the main inverter.

Power ON/OFF control

K1 is a latching (bistable) relay which mechanically holds ON or OFF state by a momentary current through the SET or RESET winding. When the PWR switch is pressed alone, the power control logic U1 activates the SET winding of K1 to switch the relay on. To the contrary, when the PWR and TX keys are pressed simultaneously, U1 activates the RESET winding to switch the relay off. In this manner, the momentary power switches (PWR/TX), together with K1/U1, work like a conventional toggle switch, keeping ON or OFF state even during mains power failure.

Primary Power Supply (+10V regulator)

When K1 is turned on, the mains input reaches the +10V regulator. The +10V regulator is a simple series-pass regulator and supplies power to the PWM controller (U3), the protection controller (U2) and other components working on the driver (primary) side of the main inverter.

Main Inverter

When power is supplied to the PWM controller, it starts operation and alternately turns on and off two switching FETs (Q2/Q3) connected to the primary winding of T1. The resultant AC voltages obtained on the secondary windings are rectified and smoothed to +12V and -12V, and delivered to various circuits in the equipment. The voltage taken from the +12V line is fed back to the PWM controller through the voltage adjuster (VR1), the error amp (Q31/CR33) and the photo-isolator (U5) to maintain the +12V output constant.

Sub Inverter

U6/Q32 and the associated circuit form a PWM switching regulator for +5V and +32V. The voltage taken from +5V line is fed back to U6 through the voltage adjuster (VR2) to maintain the +5V output constant.

Scanner Motor Power (ANT+12V/ANT-12)

In Model 1751/1761, +12V and -12V outputs (ANT+12V/ANT-12V) are used to drive 24V scanner motor. While in Model 1731, only ANT +12V/Ground is used for scanner motor. K2 relay, driven by Q33 transistor, switches on and off the ANT +12V line by the ANT SW signal from the processor board.

Protectors

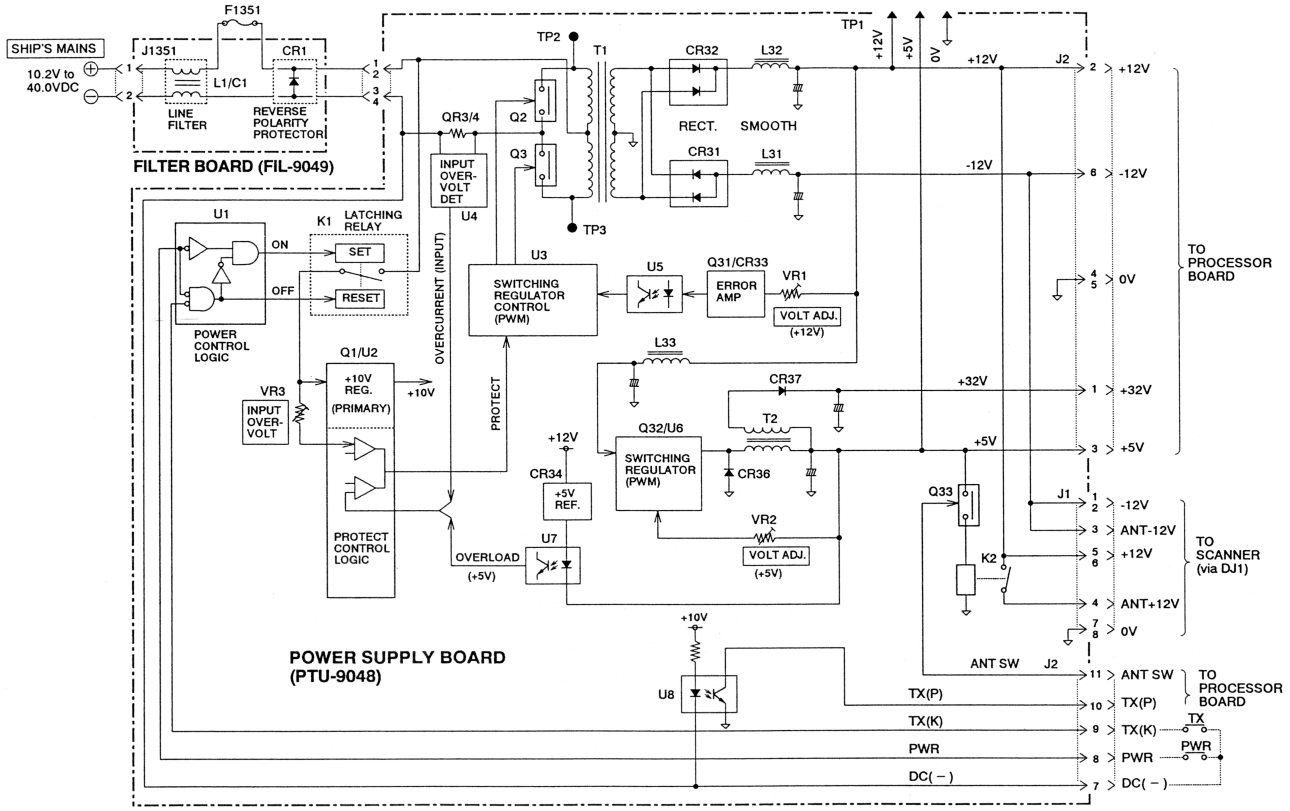
Protection of power supply circuit is achieved by stopping the drive signals to the switching FETs (Q2/Q3).

Overload on +5V line is detected by CR34 (5V zener) and U7 (photo-isolator). When the +5V line is reduced by a heavy load, U7 becomes conductive and consequently disables the PWM controller through U2 and U3.

Overcurrent on the mains input line is detected by R3//R4 and U4. The voltage drop across R3//R4 becomes large when the inverter is overload or when the input voltage is too low. Overcurrent detector U4 disables PWM inverter U3 when the voltage drop exceeds a certain level.

Overvoltage of mains input is detected by the comparator contained in U2. VR3 is adjusted to set the overvoltage protection threshold level to 40.0V.

BLOCK DIAGRAM OF POWER SUPPLY (MODEL 1731/1751/1761)



PROCESSOR BOARD (Model 1721/31/51/61)

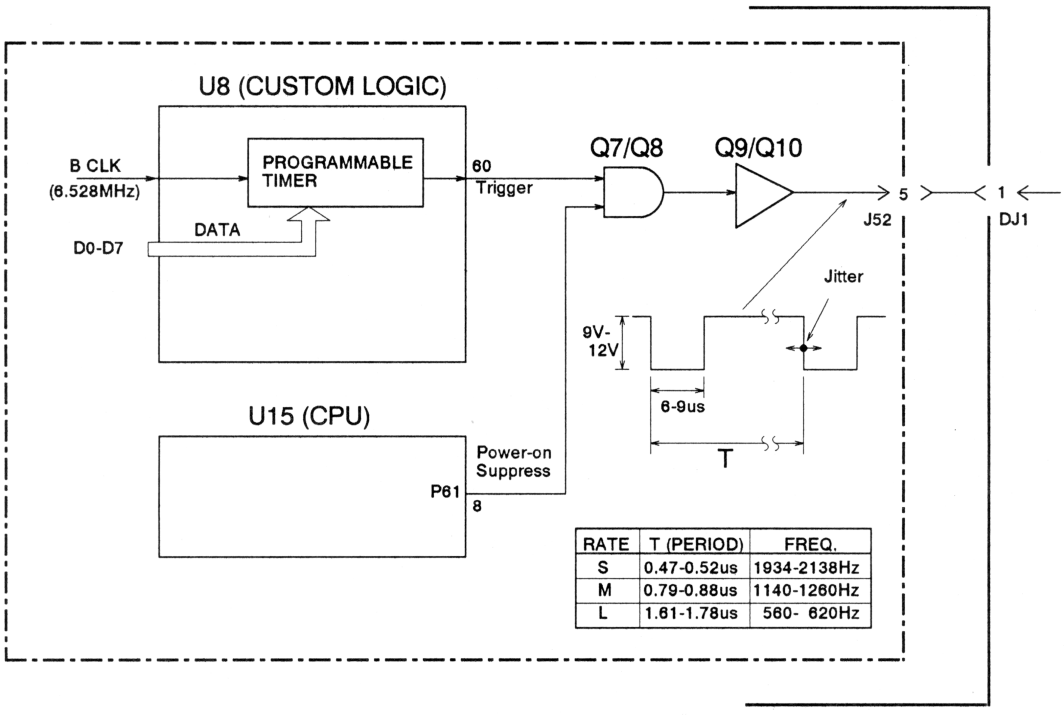
Trigger Pulse Generation

See the block diagram below.

The trigger pulse is generated by the programmable timer contained in custom logic U8. Depending on the selected range, the CPU sets the timer for an appropriate repetition interval, and the trigger pulses with jittering interval are obtained.

To the timer, the trigger enable/disable signal is also applied from the CPU depending on the Transmit/Stand-by state of the radar. The trigger pulse of TTL level is converted to 12V swing through the external buffer (Q7) and the driver (Q9/Q10), and then sent to the scanner unit.

Q8 connected across Q7 is controlled by the CPU through P61 port and functions as the trigger suppressor. The suppressor becomes active just after power-on and blocks false (or unintentional) trigger being sent to the transmitter. The suppression is maintained until 3-minute warmup delay is over.



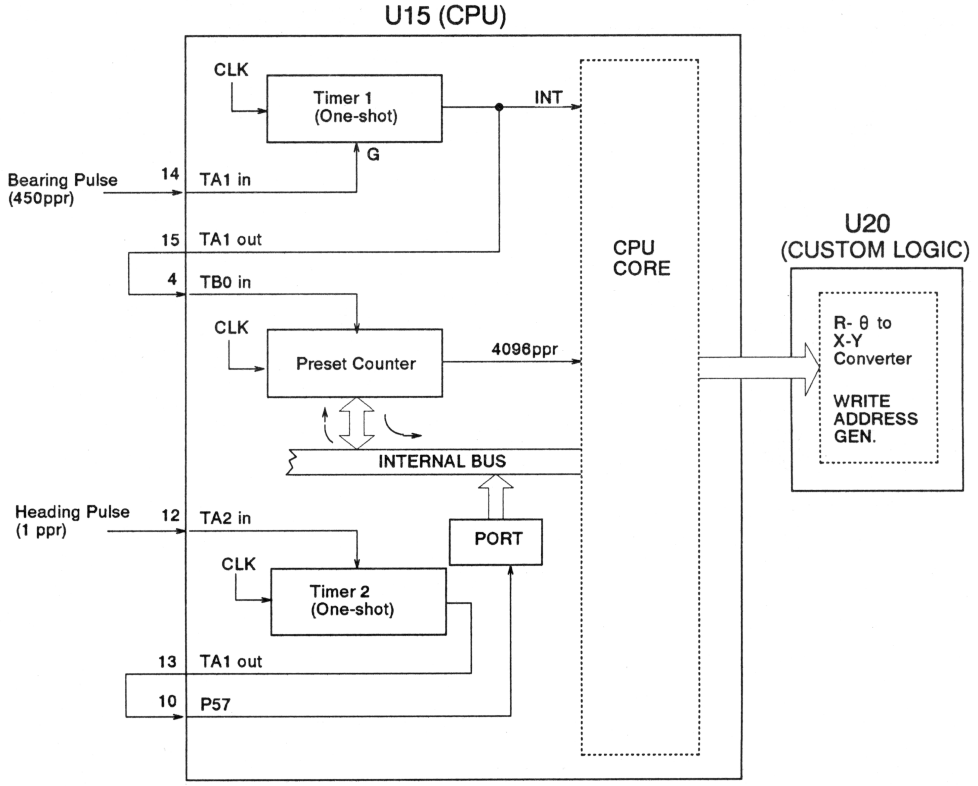
RATE	T (PERIOD)	FREQ.
S	0.47-0.52us	1934-2138Hz
M	0.79-0.88us	1140-1260Hz
L	1.61-1.78us	560- 620Hz

Bearing Pulse and Heading Pulse Handling

The bearing pulse of 450 ppr is sent down from the scanner unit. If the screen memory is swept in 450 ppr (0.8°/sweep), the radar display will become spokey because some of the memory cells near the radial sweep edge will never be accessed (written with echo data). To cover entire screen memory, the sweep is rotated in 4096 steps per revolution. Unlike the PLL multiplying system used in previous models, this radar derives 4096 ppr signal from 450 ppr one by using digital tracking system under the CPU control. (See the block diagram below.)
The bearing pulse is shaped into narrow pulse by the timer (one-shot multivibrator) inside the CPU (U15), and the resultant pulse causes interrupt to the CPU.
Upon reception of the first interrupt, the CPU programs the internal timer (preset counter) with the standard value to obtain 4096 ppr. In the next interrupt, the CPU reads the counter contents and compares the count with the expected count. The CPU then modifies the preset value to compensate the error. In the third interrupt, the CPU compares the last count and the present count and modifies the preset value, and so forth. In this manner, the CPU tracks on 450 ppr signal while generating and correcting 4096 ppr signal.

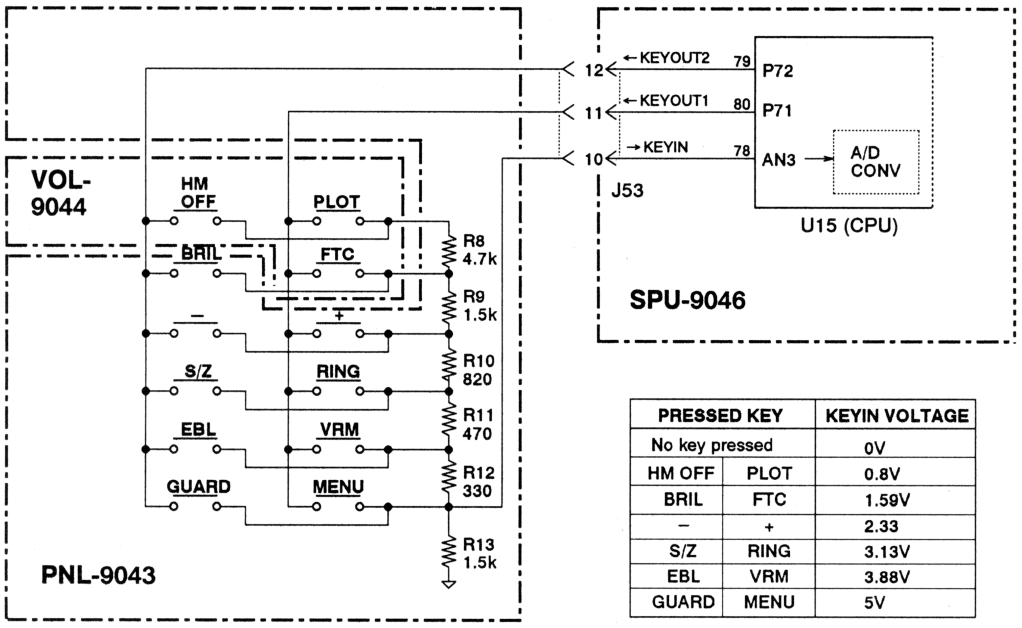
The heading pulse from the scanner unit is shaped into narrow pulse by the timer in the CPU, and the timer output is fed back to the input port (P57) of the CPU.

At each interrupt of 450ppr bearing pulse, the CPU senses the heading pulse through P57. If the heading pulse exists, the CPU resets the bearing count to zero (i.e., points the sweep toward bow direction) after certain delay preset for heading alignment.



Keyboard Sensing

The front panel keys, except the PWR and TX keys, are connected within the resistor network as in the figure below.
In every 100ms, the CPU senses the keyboard status by using two output ports (P71/P72) and one analog input port (AN3). That is, the CPU puts "H" (+5V) alternately on two output ports (column lines), and at each time, it reads voltage level of resistor network. The CPU can identify a pressed key by combining column information and voltage level inherent to pressed key. Unlike traditional row/column matrix system, the analog sensing system requires less wire-runs between pc boards.

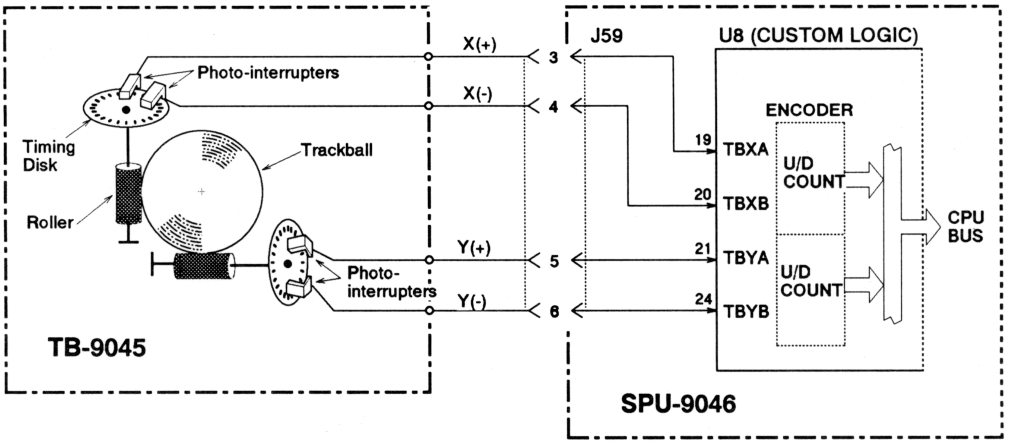


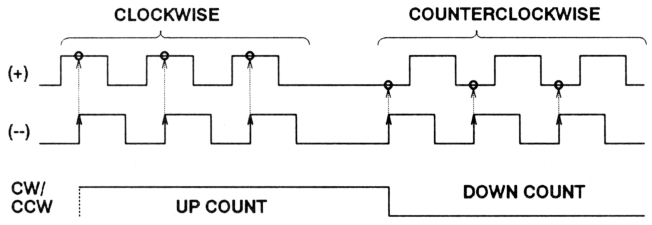
PRESSED KEY		KEYIN VOLTAGE
No key pressed		0V
HM OFF	PLOT	0.8V
BRIL	FTC	1.59V
–	+	2.33
S/Z	RING	3.13V
EBL	VRM	3.88V
GUARD	MENU	5V

Trackball Sensing

The trackball movement is sensed by the CPU through the encoder contained in custom logic U8. (See the figure below.)

The ball movement (rotation) is resolved into X-Y movements by the rollers arranged in right angle. The timing disk, fixed on each roller shaft, has two sets of slits phased each other. As the disk rotates, two photo-interrupters pick up the slit passes and generate two pulse signals phase-shifted each other.
The trackball encoder, up/down counters in custom logic U8, translate the advance/delay state of the pulses into direction information (up-count or down count), and the number of pulses into the moved steps.
The CPU detects trackball movement (direction and steps) by reading contents of the X and Y counters at a certain interval.





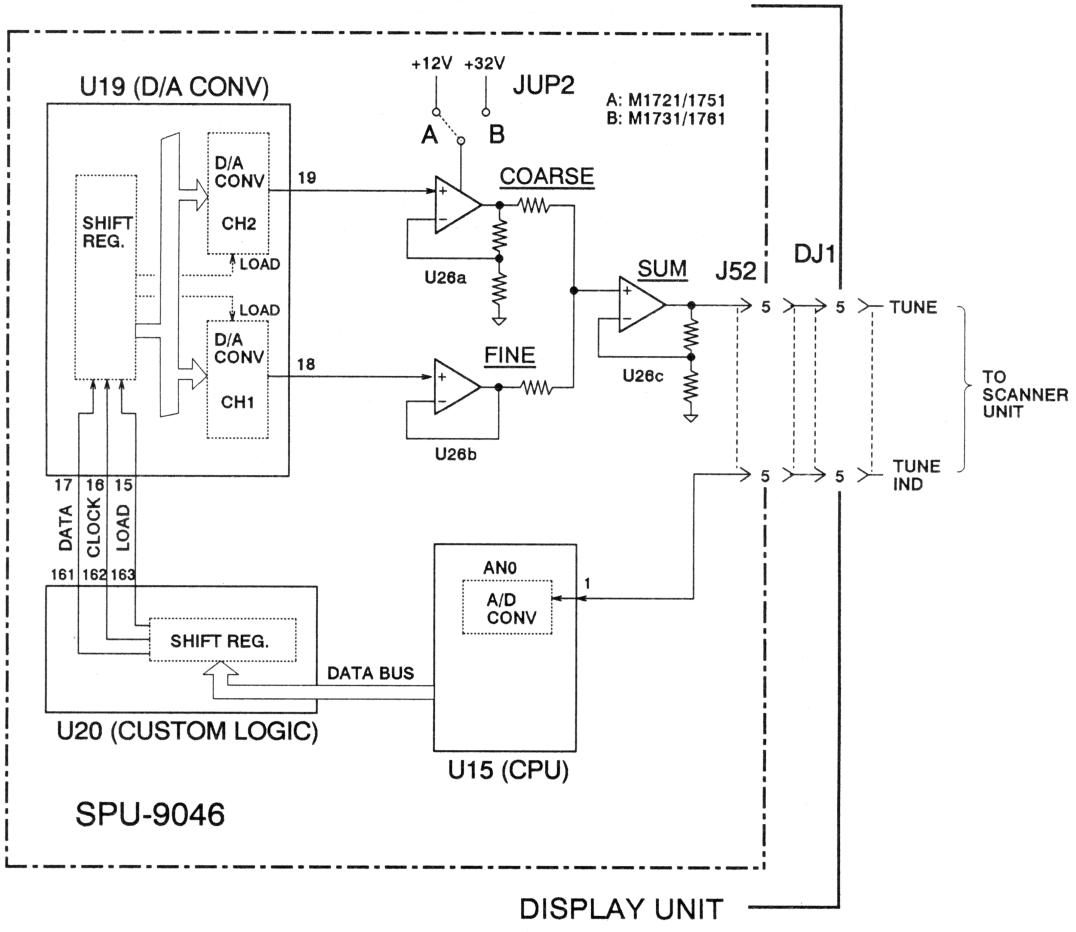
Auto-Tune Control

Automatic tuning of the receiver is achieved under the control of CPU.

Refer to the block diagram below.

U19 is a 12-channel 8-bit D-A converter and is interfaced with the CPU through clocked-serial lines (data/clock/load). The tuning voltage is created by using two of the analog channels A01 and A02.
U26a is a x6.5 amp and used for coarse stepping of the tuning voltage. While U26b is a x1 amp (voltage follower) for fine stepping. U26c is a summing amp to add coarse and fine voltages, and its output controls the frequency of local oscillator in the MIC. Supply voltage to these op-amps is selected with jumper connector JUP2 depending on the tuning voltage range of the MIC in use. (+12V for M1721/1751 and +32V for M1731/1761)

Every time the radar is switched from standby to transmit, the CPU loads the D-A converters with series of values to sweep the tuning voltage over entire tuning range. And in each step, the CPU reads the TUNE IND voltage level through its analog input port (AN0) for seeking a tuning peak. After an initial tuning sweep, the CPU sets the D-A converters with the values when peak was detected. Hereafter, the CPU tracks on the tuning peak while controlling the tuning voltage in fine steps.

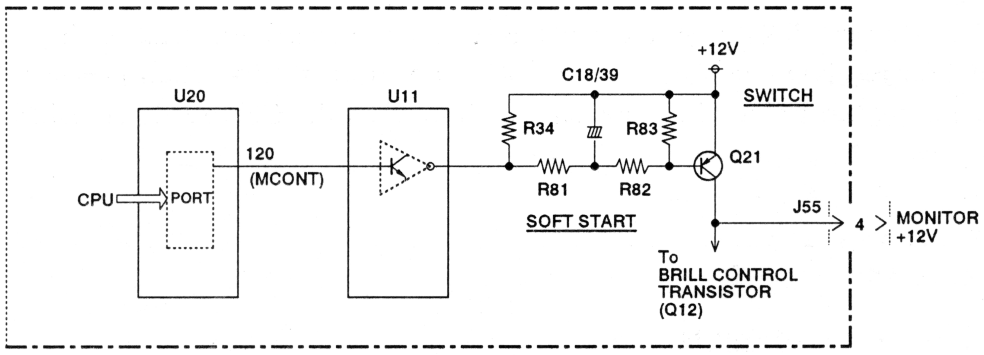


CRT Power Control

To allow Watchman or Economy mode of operation, the power to the CRT unit is supplied not directly from the power supply board but through the transistor switch under the control of the CPU.

As in the diagram below, the CPU can switch on or off the CRT supply by setting or resetting the MCONT bit of the output port in custom logic U20 through the CPU data bus. The CRT power is switched on during transmission, and is switched off in the economy (stand-by) state. In the Watchman mode, the CRT power is switched on and off depending on the user-selected interval.

C39/C18 and R81 at the base of switch transistor Q21 act as a soft starter so that the over current protector (in the power supply board) may not trip by the rush current to the CRT unit.

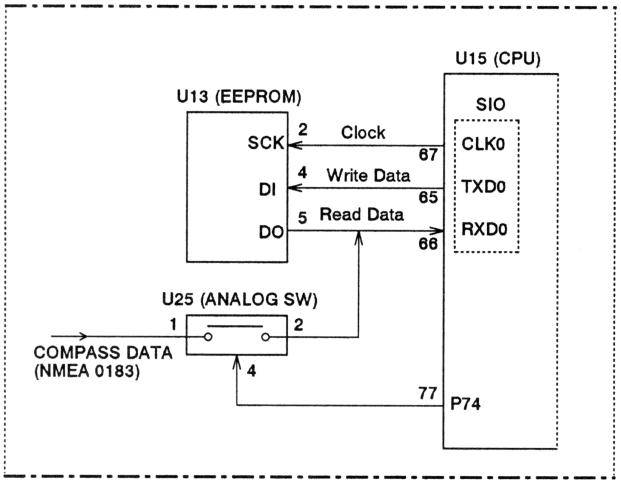


Backup Memory (EEPROM)

To memorize the presets at installation and to start the radar with same condition as it was turned off, this radar employs the EEPROM as a backup memory. EEPROM is a non-volatile memory of which contents can be erased and updated electrically. Unlike conventional static RAM backup system, EEPROM requires no keep-alive battery.
As in the diagram below, the EEPROM (U13) is interfaced with the CPU (U15) using clocked-serial lines (shift clock/data in/data out).

Every time the power is turned on, the CPU reads the contents of the EEPROM and sets up the radar system accordingly.
Write to the EEPROM occurs immediately when some setting has changed by key operation or by menu item selection. As for the TOTAL ON TIME and TOTAL TX TIME, EEPROM update occurs in every 10 seconds.

The serial input port RXD0 of the CPU is commonly used for reading EEPROM contents and for receiving heading data in NMEA0183 format (if so connected). Analog switch U25 is used to isolate the compass data line when the CPU reads the EEPROM contents.



NAV Data Handling

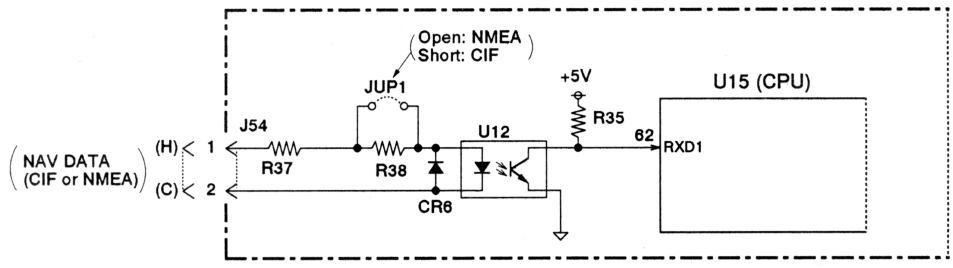
This radar can receive and display the following navigational data either in FURUNO CIF or in NMEA0183 format.

NMEA (**: any talker)
**GLL - Present position in L/L
**TVG - Ground speed/course made good
**BWC - Range/bearing to waypoint
**RMA - Loran-C composite data (POS/TD/SPD/GRI...)
**RMB - Navigational composite data on waypoint (WP POS/XTE/RNG/BRG)
**RMC - GPS/Transit composite data (POS/SPD/CRS...)
**GTD - Loran-C TDs
**HDG - Magnetic heading/deviation/variation

FURUNO CIF
Present position in L/L
Range/bearing to waypoint
Speed/course
Loran-A TDs
Loran-C TDs

See the diagram below.

Navigational data from other equipment is first applied to opto-isolator U12. Amount of current through the isolator is selected by jumper JUP1 according to the incoming data format. JUP1 open (low current) for NMEA and short (high current) for CIF.
The output of the isolator is fed to the serial input port (RXD1) of the CPU. The CPU picks up and transforms necessary data and sends them to the character plane of the screen memory via the GDC. Note that the CPU can automatically distinguish data format, NMEA or CIF.

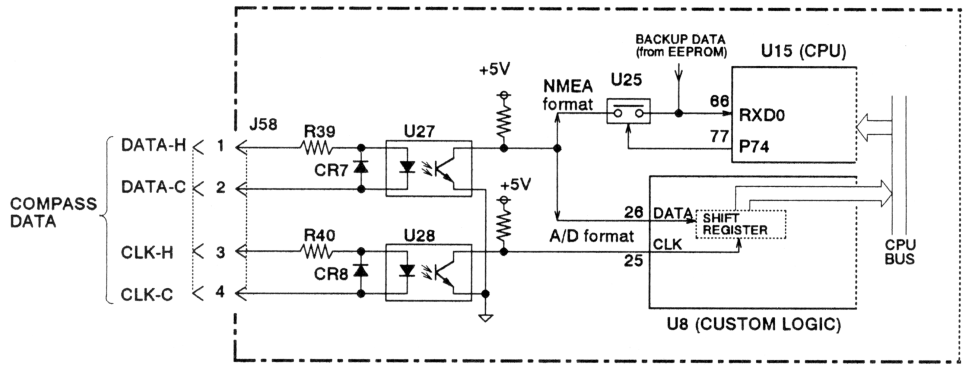


Compass Data Handling

This radar can accept heading (compass) data either in FURUNO AD-10 format (clocked serial) or in NMEA0183 format (asynchronous serial).

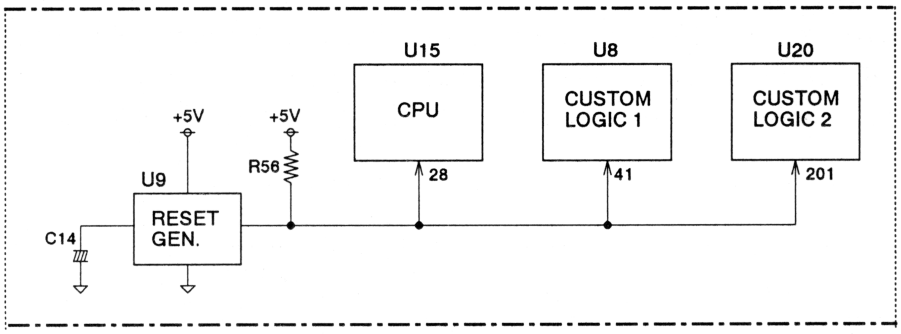
See the diagram below. Data and clock signals from the gyro interface (AD-10S/100) or fluxgate heading sensor are opto-isolated by U27 (data) and U28 (clock), and then fed to the 16-bit shift register in custom logic U8. The shift register converts serial data into parallel one and passes it to the CPU.

If the heading data is supplied in NMEA0183 format (**HD*), the serial interface (RXD0) in the CPU receives the data through opto-isolator U27 and analog gate U25. The analog gate is for isolating the heading input from the serial port when the CPU reads the backup data from the EEPROM just after power-on.



System Reset

At power-on or at momentary power failure, the supply voltage and clock pulses to the CPU and the associated logics are unstable. If the CPU executes program under such condition, the system may hang up or run erratically.
Reset generator U9 holds the reset line to "L" level to suppress operation of the CPU and other logics until the supply voltage and the system clocks become stable. C14, connected to the reset generator, determines an additional sustain period (delay time) of the reset signal after voltage exceeds certain level. As soon as the reset line is set to "H" state, the CPU starts execution of the program from the very beginning.

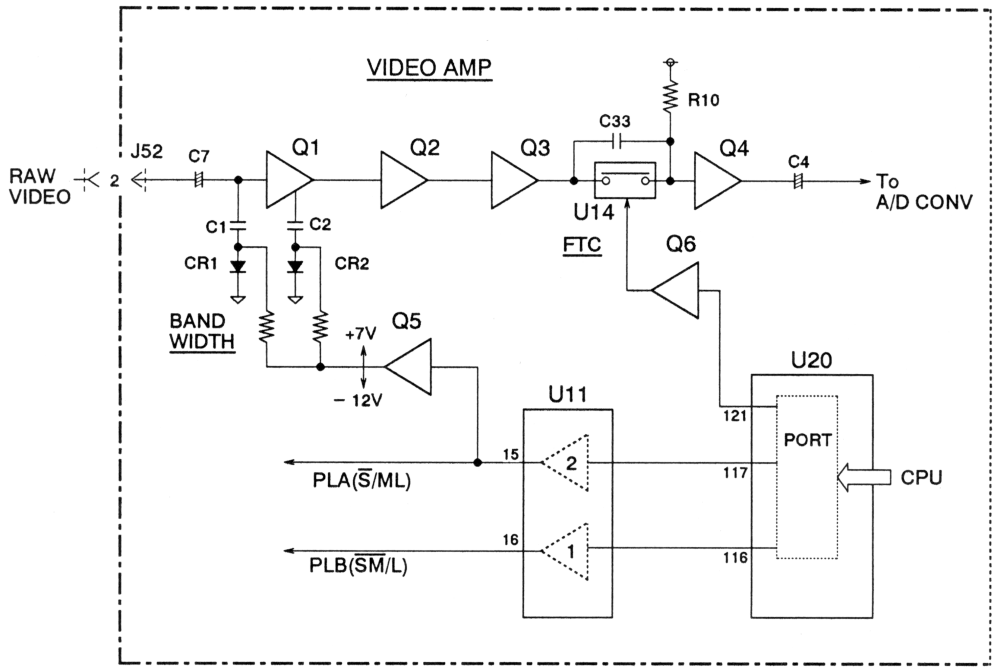


VIDEO SIGNAL FLOW (in the Display Unit)

Video Amp

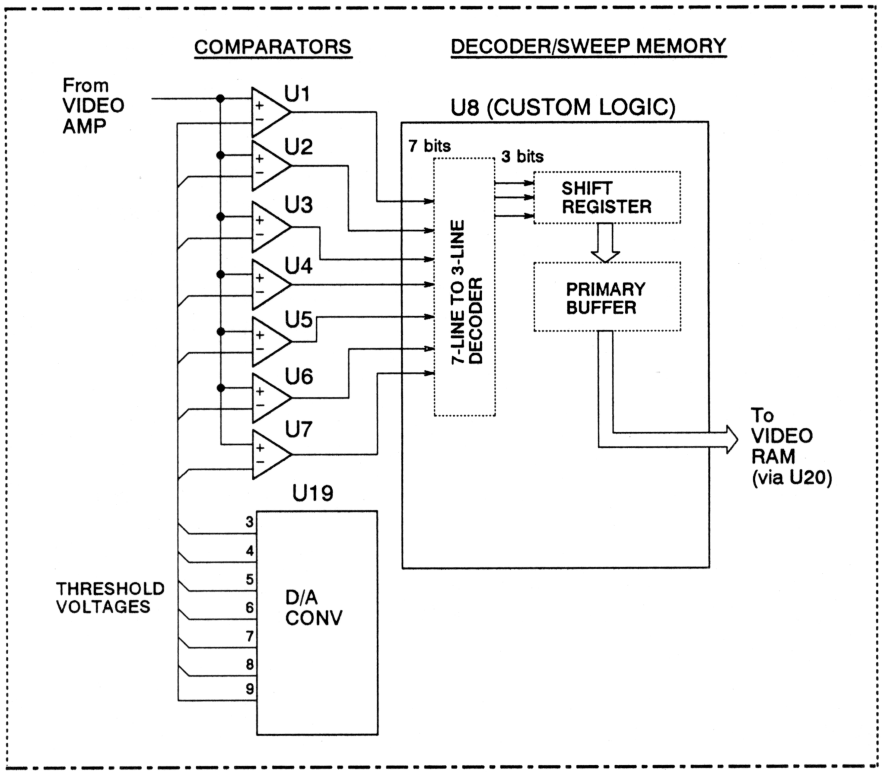
Video signal from the IF amp is further amplified in the SPU board.
To the first stage of the video amp (Q1), small bypass capacitors (C1/C2) with diode switches (CR1/CR2) are connected. These switches are turned on and off by the PLA signal through Q5 to change the bandwidth of the video amp; wide for short range and narrow for medium/long ranges.

The analog gate (U14), inserted between Q3 and Q4, is to switch on and off the FTC function. When the gate is on (FTC off), the video signal passes through the gate as it is. When the gate is off (FTC on), the video signal goes through the differentiating circuit of fast time constant (C33/R10), and accordingly, the leading edges of echo pulses are extracted.



High-speed A-D Conversion

The output of video amp is applied simultaneously to seven comparators set for different thresholds. In custom logic U8, the 7-line comparator output is encoded into 3-bit binary data and then stored into the primary buffer memory at a sampling rate for a selected range.



Scan Conversion (Radial to Raster)

Time sequence of video signal from the receiver is for radial sweep (PPI). While the video output to the CRT unit is for raster sweep. As the read address of the screen memory is linear for raster sweeping, the write address for incoming video signal must be generated by converting the R-θ (polar) coordinates into X-Y coordinates.

The EPROM (U16) contains the table of SIN and COS values in 0.088° steps (360/4096). (In practice, only SIN values from 0 to 90 are contained and the rest of the values are derived by inverting the order or sign.)
Every time the 4096ppr pulse is detected, the CPU reads the table and then writes the corresponding SIN and COS values to the SIN θ and COS θ latches, respectively.
The output of the SIN θ latch is fed to one input of the adder. The second latch latches the output of the adder at every R-clock (Range clock), while feeding the output back to the other input of the adder. As the result, the adder accumulates SIN θ values at R-clock interval. (R x SIN θ)
The address counter counts carry (overflow) output of the adder and delivers the count as a write address (X address) for the screen memory (echo plane).
Y address is derived in the same manner as X address, except COS θ instead of SIN θ .

The X and Y offset latches determine the location of sweep center (or initial address) on the screen memory. The CPU loads the latches with different values according to the selected display mode; normal, shift or zoom.

According to the write-address generated by the scan converter, 3-bit echo data from the primary buffer (U8) are stored into the screen memory.

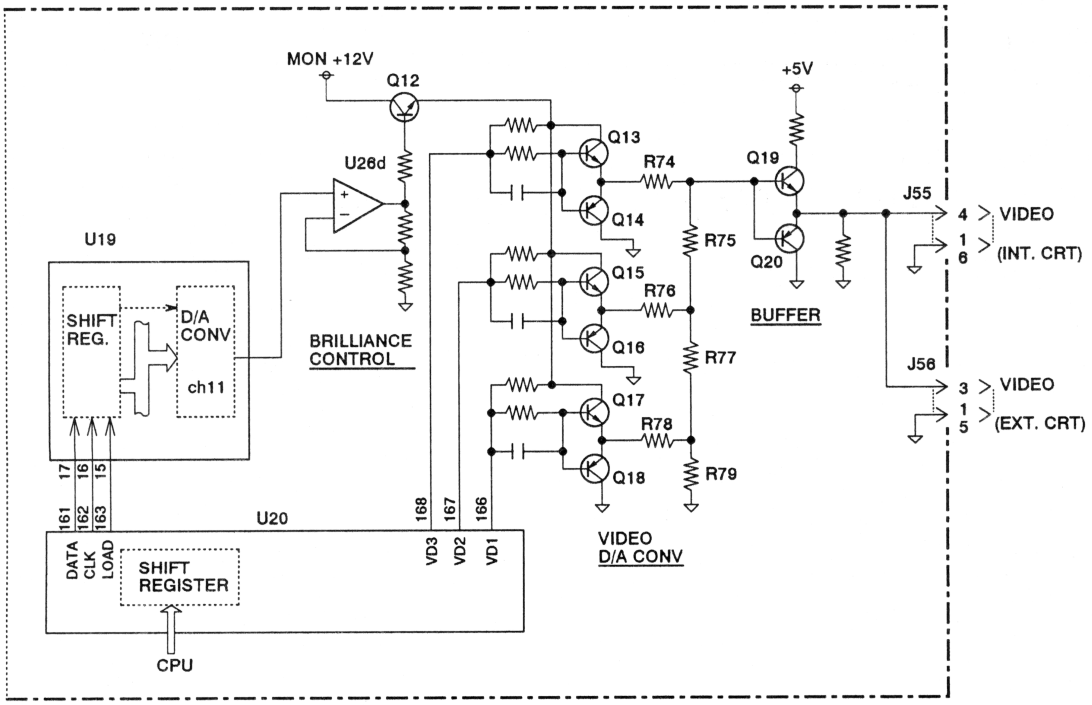
GDC (Graphic Display Controller)

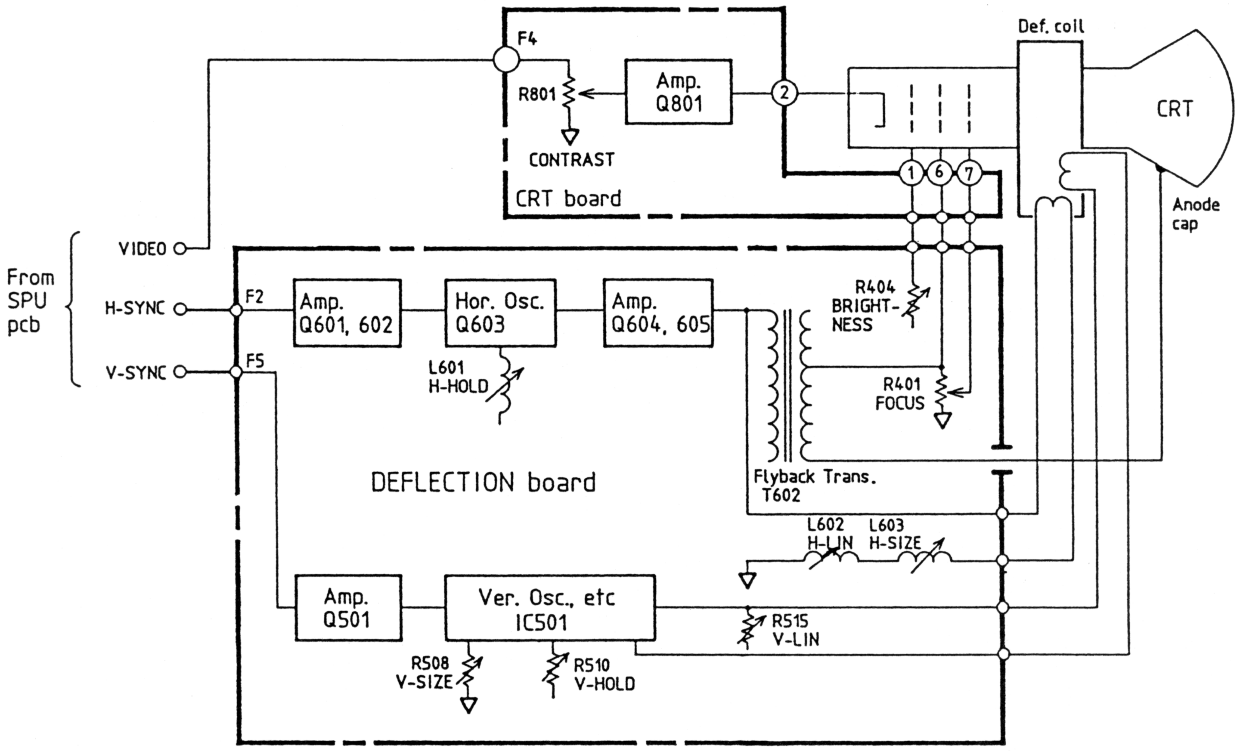
GDC (U18) is a kind of microprocessor oriented for display data handling. In this radar system, the GDC serves to draw marks and characters into the screen memory (mark and character planes). It also generates read-address for echo/mark planes and CRT control signals (H-sync/V-sync) for raster scanning.

Raster Video Circuit

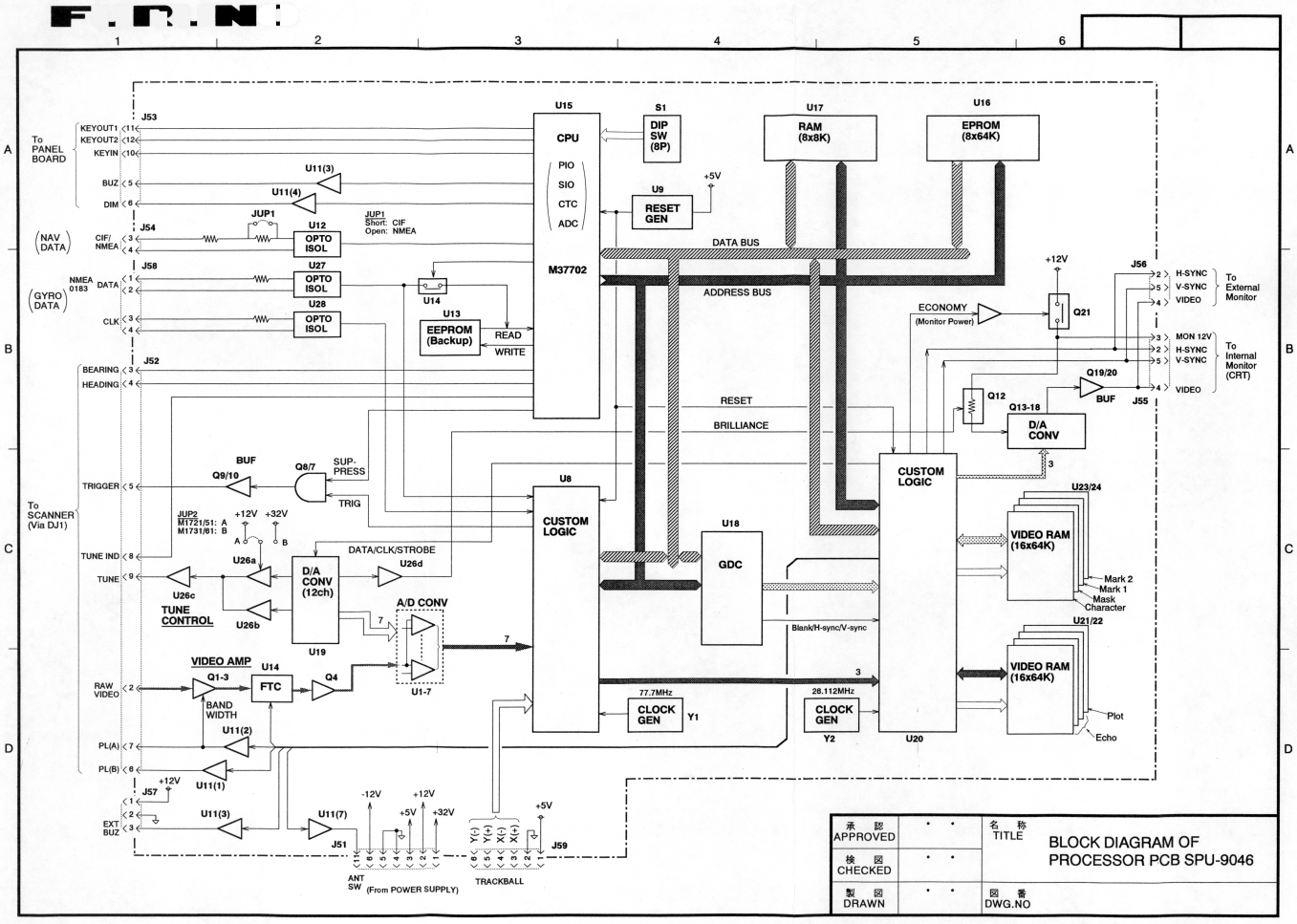
3-bit video signal read from the screen memory, in synchronous with dot clock, is applied from custom logic U20 (VD1-VD3) to the video D-A converter. The video D-A converter consists of switch transistors (Q13-Q18) and R-2R ladder network (R74-R79), and converts 3-bit binary data into 8-level amplitude signal. The resultant analog video signal is buffered by complementary transistors Q19 and Q20, and then distributed to the CRT unit and to the external monitor connector.

Display brilliance is adjusted in eight steps by changing the reference voltage to the video D-A converter. Every time the BRILL key is operated, the CPU loads new data into A11 channel of D-A converter U19. The analog output of U19 is buffered by U26d and Q12, and then applied as the reference voltage for the video D-A converter.





Block Diagram of CRT Display A1QA9DSP45



承認 APPROVED		名称 TITLE	BLOCK DIAGRAM OF PROCESSOR PCB SPU-9046
検図 CHECKED			
製図 DRAWN		図番 DWG.NO	

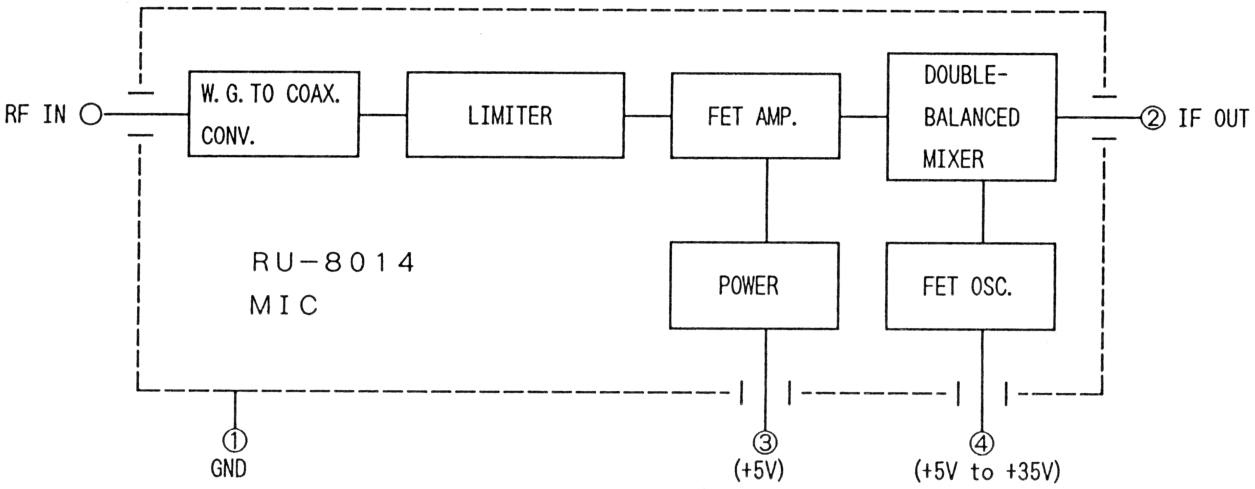
MIC & AMPLIFIER

The following description is for reference only.

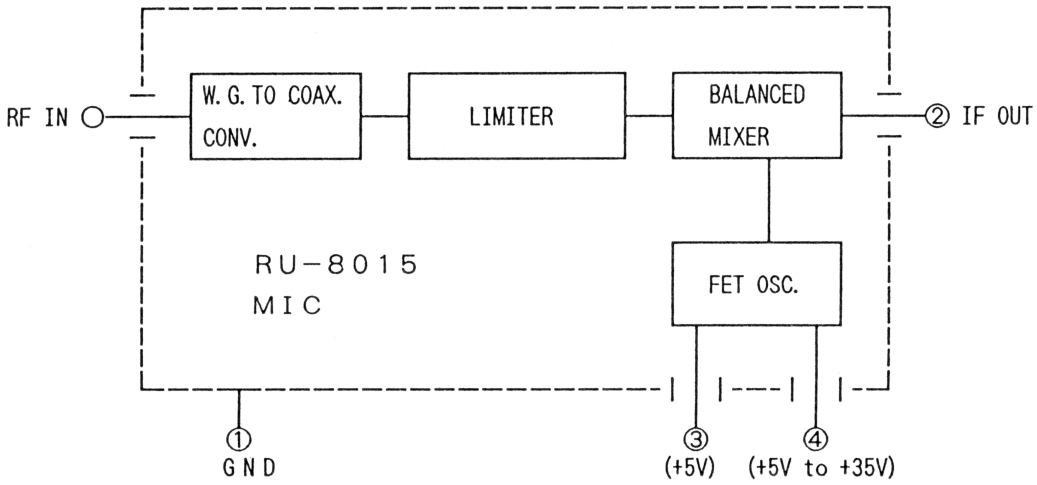
As a general rule of thumb, the radar requires better noise figure (NF) and better dynamic range. Both factors, however, are reciprocal. The NF affects long range performance, while the dynamic range does short range performance.

The MODEL 1731/1751/1761 radars let the user select which characteristic is important for him. This selection can be done by changing the MIC and the characteristic of the IF amplifier (by jumper selection). The standard combinations of the MIC and IF amplifier board and suitability, "○", "△", "×" in order, for each factor are outlined in the table below.

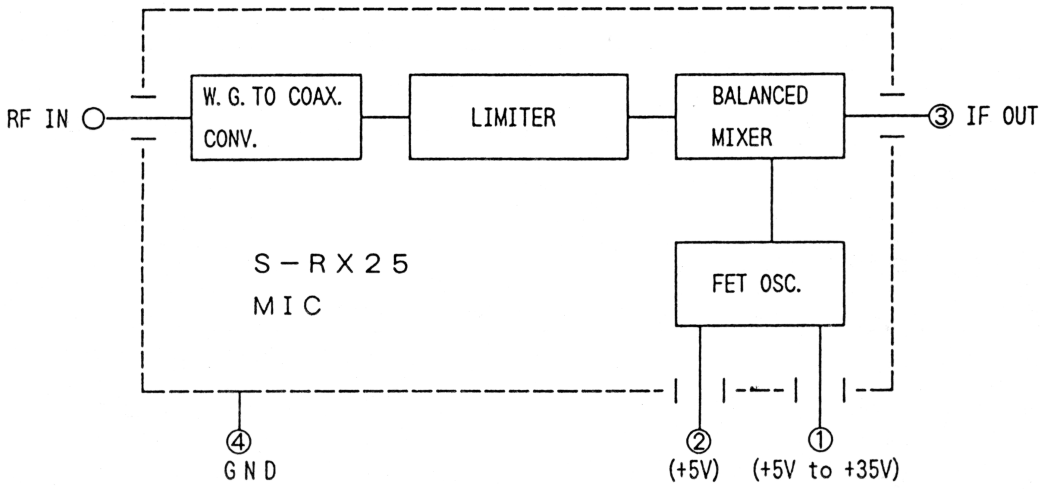
MIC & IF AMP / FACTOR	MIC		IF AMP PCB	
	RU-8014 (with RF Amp.)	RU-8015 (without RF Amp.)	IF-7758D (JP601 open)	IF-7758C (JP601 short)
Noise Figure (Long range performance)	○	×	○	△
Dynamic Range (Short range performance)	×	○	△	○
Radar Model	Model 1761	Model 1731	Model 1761	Model 1731 Model 1751



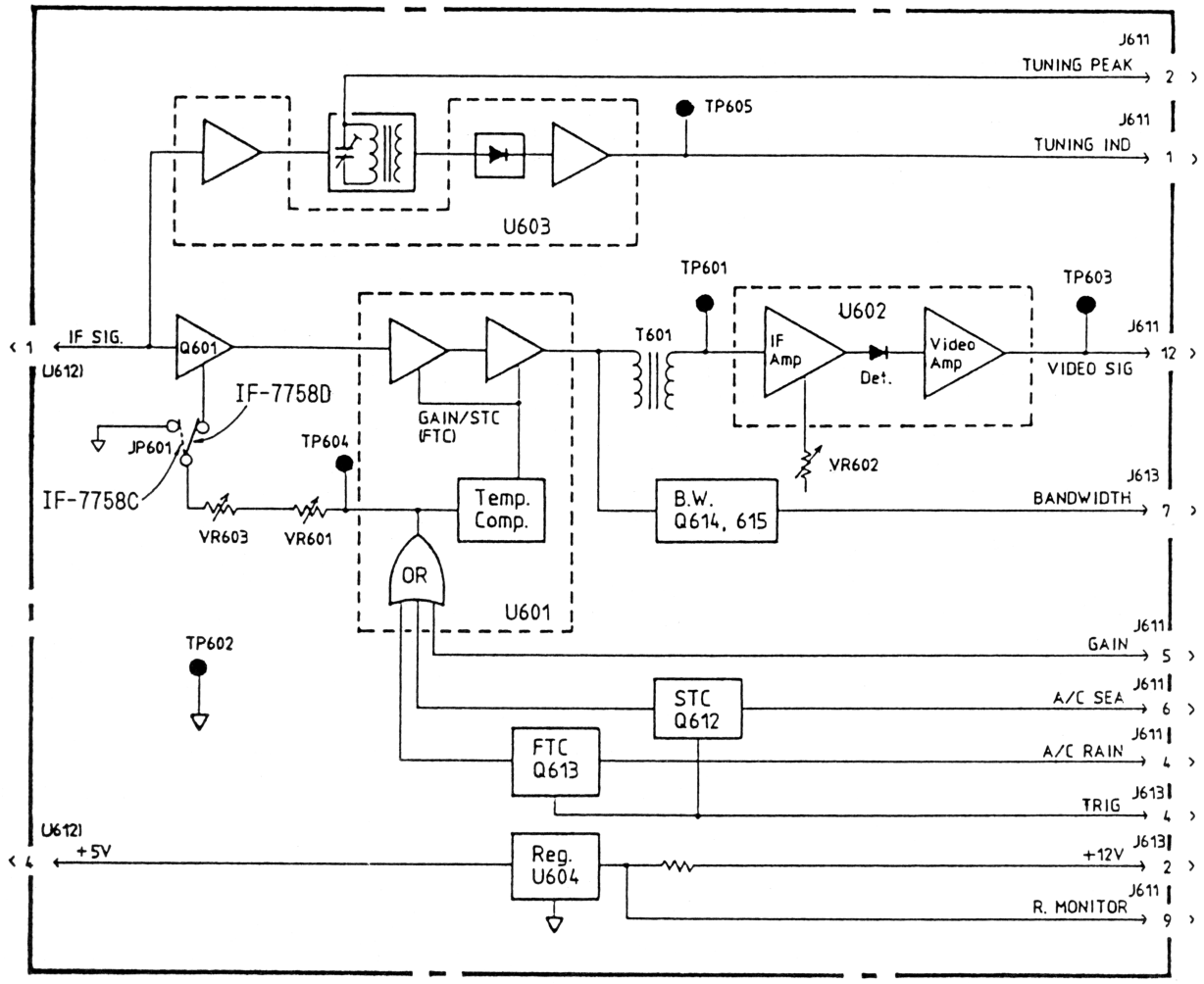
Block Diagram of MIC RU-8014



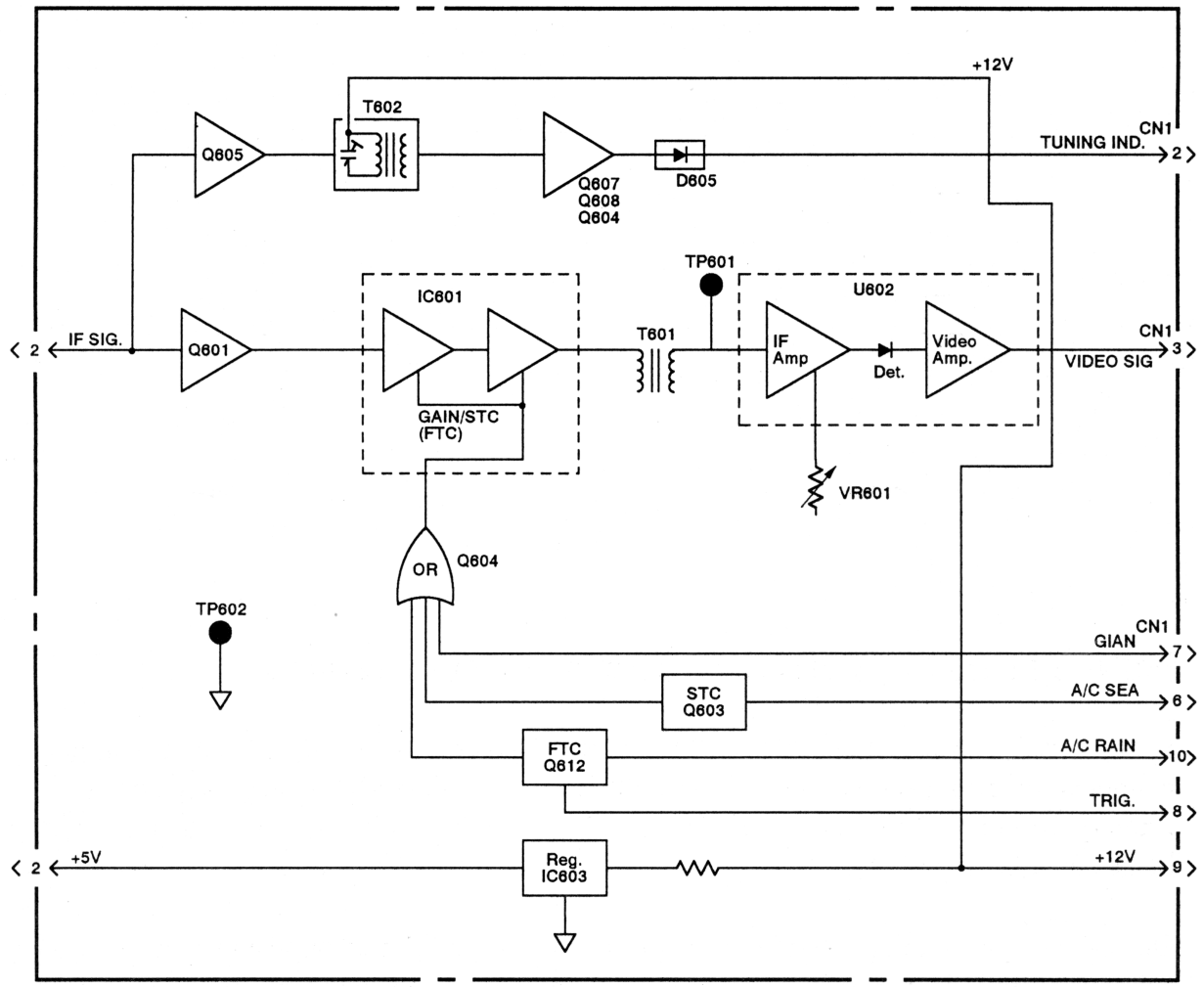
Block Diagram of MIC RU-8015



BLOCK DIAGRAM OF MIC S-RX 25,A

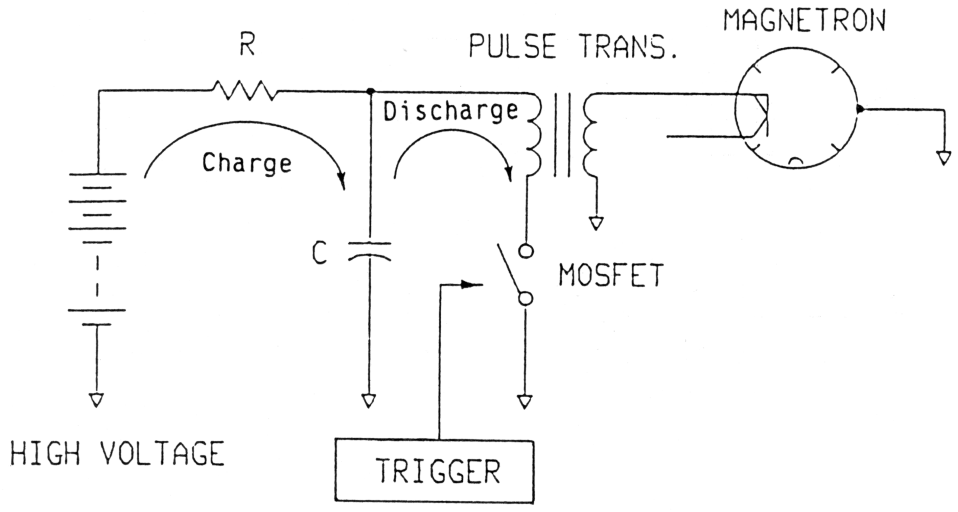


Block Diagram of IF AMP pcb IF-7758C/D



Block Diagram of IF AMP module RC-9052

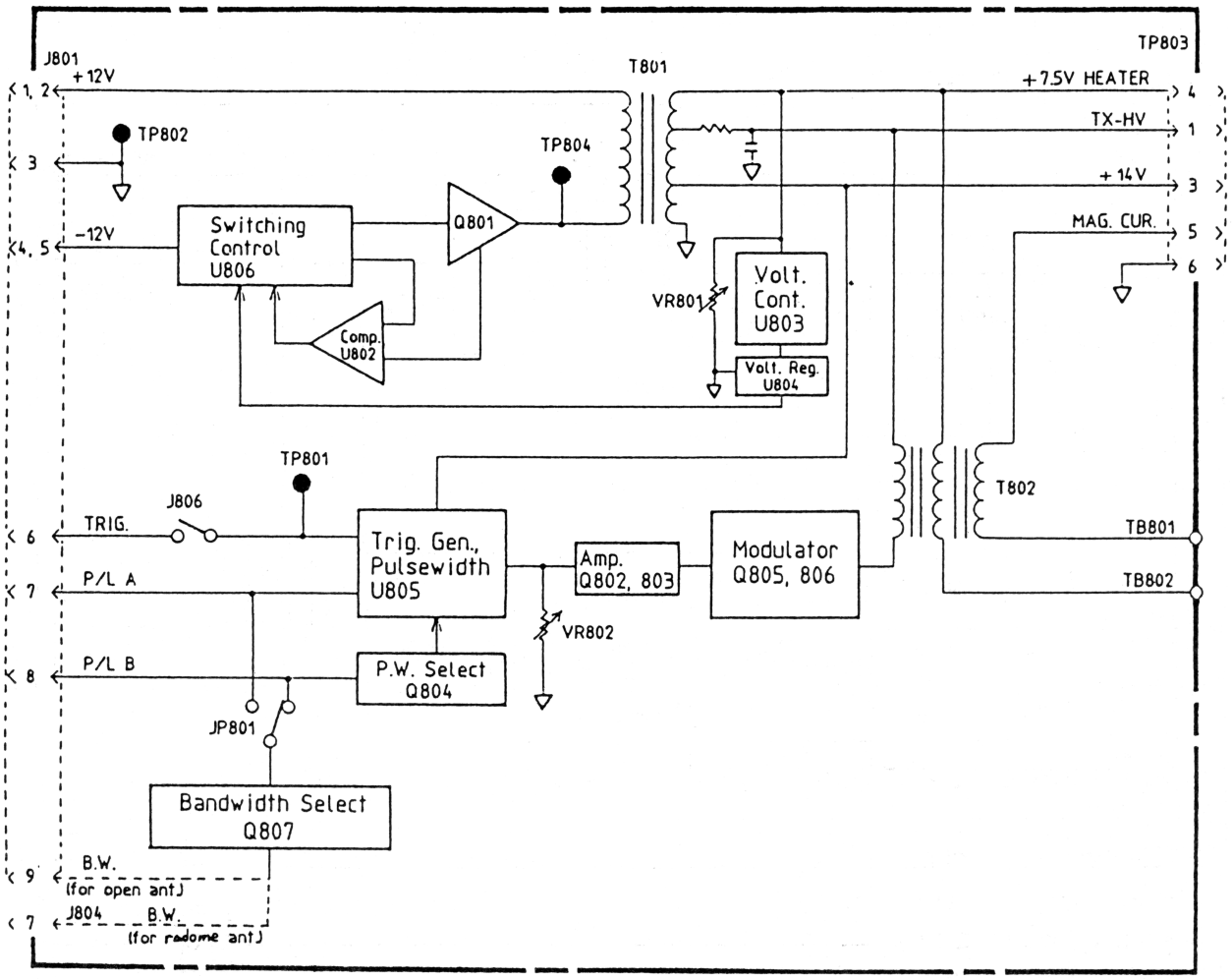
MODULATOR



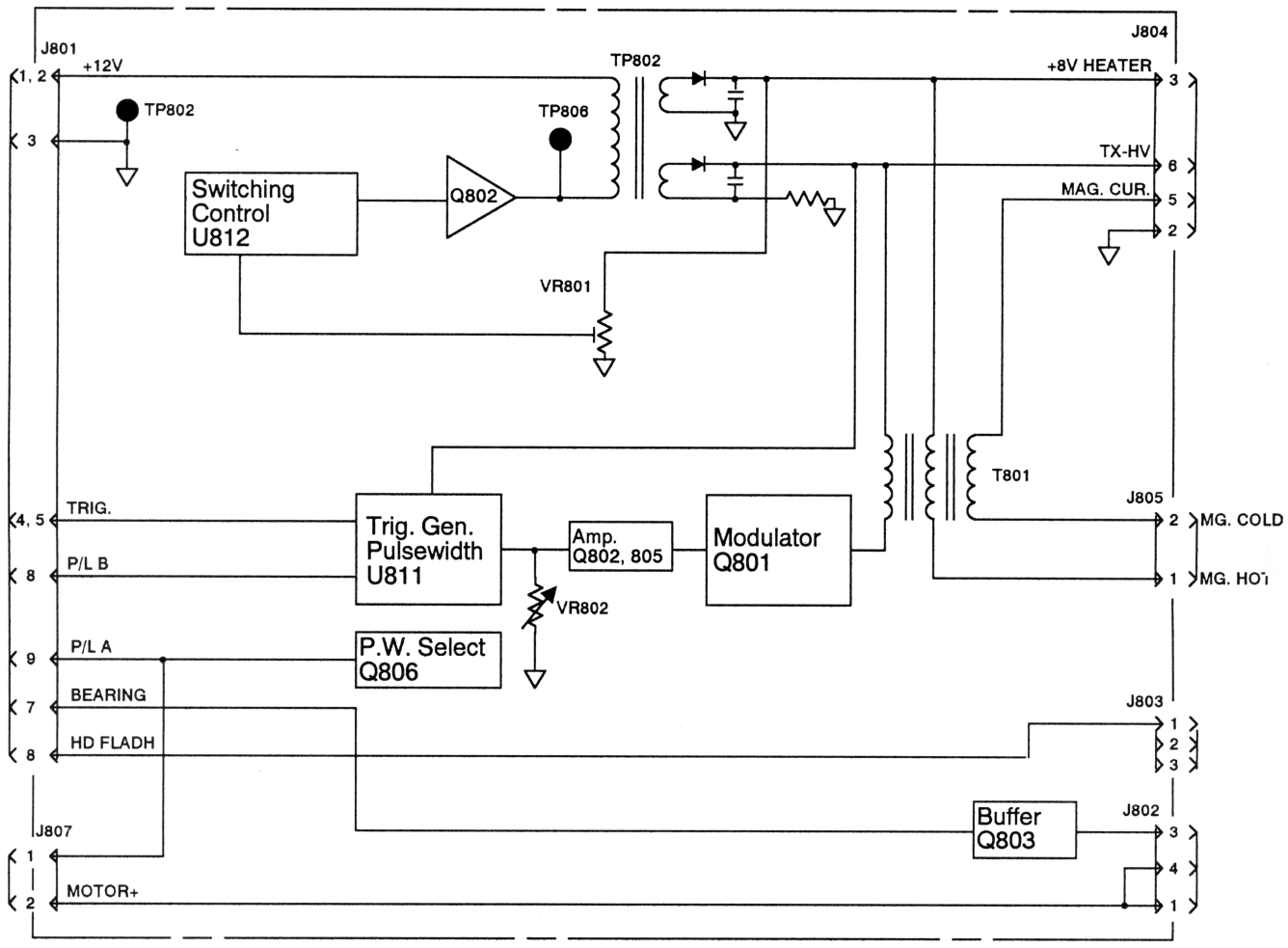
PRINCIPLE OF FET SWITCHING METHOD MODULATOR

High voltage is charged into C thru R while the magnetron is inactive. When the trigger is applied to the power MOS-FET, the FET turns on and the high voltage appears at the primary winding of the pulse transformer. This transformer boosts the voltage, which makes the magnetron oscillate.

One advantage of this method is that the magnetron oscillates only when the FET is conducive, that is the transmission pulsewidth can be changed by the TX trigger pulsewidth. Therefore, parts such as relay and coil can be eliminated.



Block Diagram of Modulator pcb MD-7918C



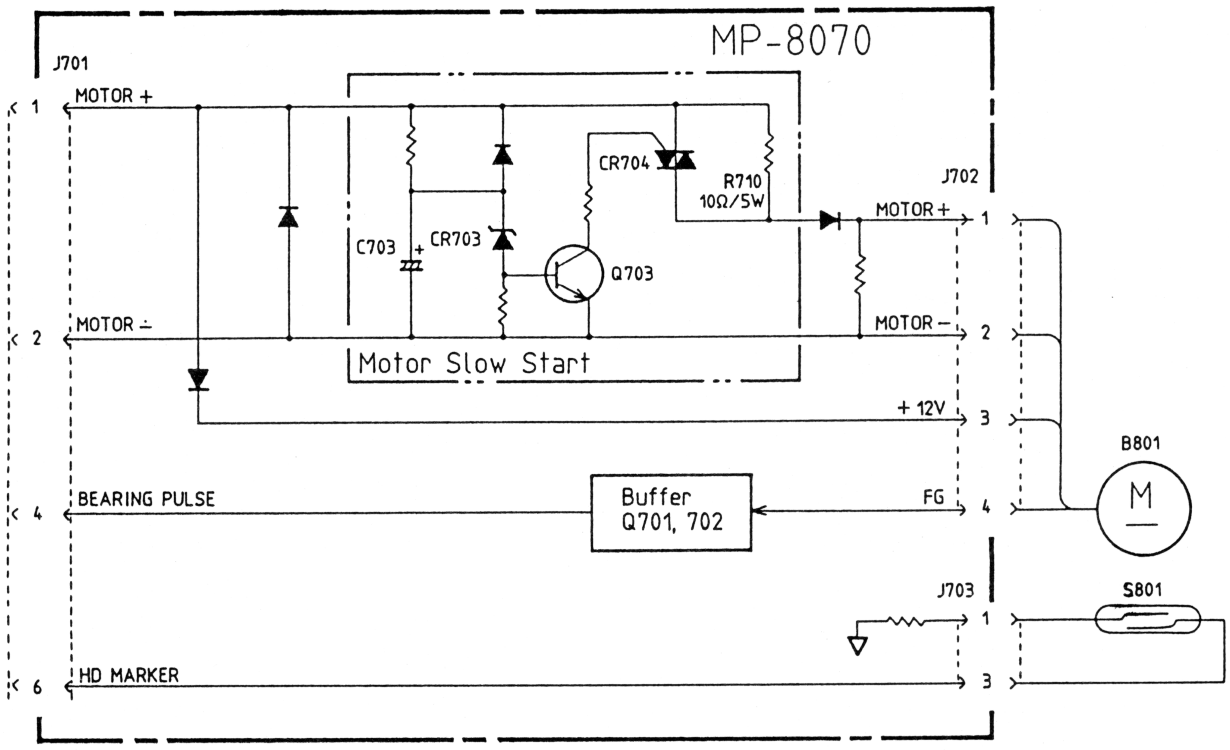
Block Diagram of Modulator pcb MD-9052

BEARING SIGNAL GENERATOR

MOTOR SLOW START CIRCUIT

The motor slow start circuit functions to prevent sudden scanner rotation when turning the power on.

When turning the power on, scanner motor B801 is made to rotate slowly by passing MOTOR + (+12V) through resistor R710 which decreases voltage. While this is occurring, capacitor C703 is charged gradually. When the voltage rises to 9.1V (zener voltage of CR703), C703 starts discharging and transistor Q703 turns on. Then, the gate current flows into TRIAC (TRIode AC switch) CR704 and MOTOR + flows through CR704. As the result, the scanner motor rotates with normal velocity (approx. four seconds after turning the power on.)



BLOCK DIAGRAM OF BEARING SIG GEN PCB MP-8070 FOR MODEL 1761

DIFFERENT POINTS OF SIMILAR PCBs

1. PROCESSOR pcb SPU-9046A/B/C/D

PCB	Switch S1:#1/#2	Jumper JUP2	Radar
SPU-9046A	ON/ON	A	Model 1721
SPU-9046B	OFF/ON	B	Model 1731
SPU-9046C	ON/OFF	A	Model 1751
SPU-9046D	OFF/OFF	B	Model 1761

NOTE : PROM U36 is commonly used.

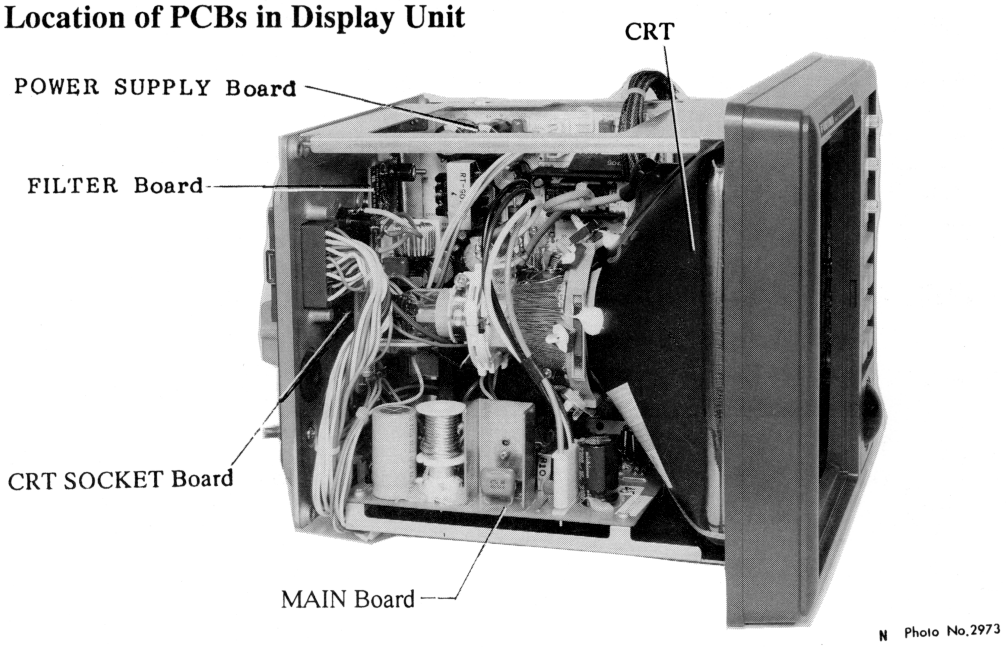
2. IF AMP pcb IF-7758C/D

PCB	JP601	Radar
IF-7758D	open	Model 1761
IF-7758C	short	Model 1731, 1751

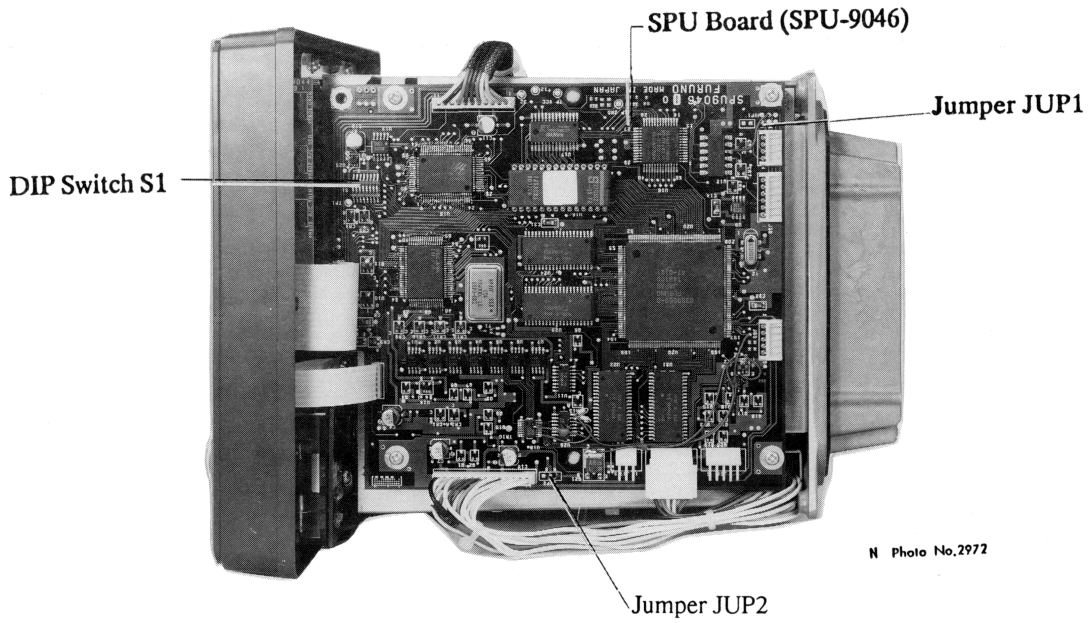
CHAPTER 3. ADJUSTMENT

ADJUSTMENT OF DISPLAY UNIT

Location of PCBs in Display Unit



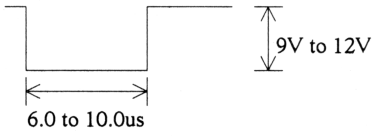
Display Unit, Left Side View



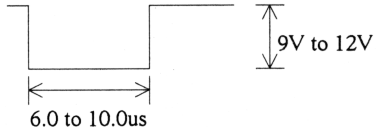
Display Unit Right Side View

Test Points in Display Unit

TEST POINTS of Model 1721

Board	Test Point	Test Item	Ratings
POWER SUPPLY (PTU-9047)	TP1	#1: +12V	12.2V ± 0.1Vdc (adjusted by VR1)
		#2: +5V	5.0V ± 0.25Vdc
		#3: GND(0V)	(base of voltage measurement)
	J1	#1: -12V	-13.1V to -14.3Vdc
		#4: ANT+12V	11.2V to 12.3Vdc
		#8: GND(0V)	(base of voltage measurement)
	TP2 DC[-]	Inverter Frequency	90kHz ± 5% (*DC[-] is floating from chassis.)
PROCESSOR (SPU-9046)	J52	#5: Trigger #1: 0V(GND)	 1934Hz to 2138Hz (short range) 1140Hz to 1260Hz (medium range) 560Hz to 620Hz (long range)

Test Points of Model 1731, 1751 and 1761

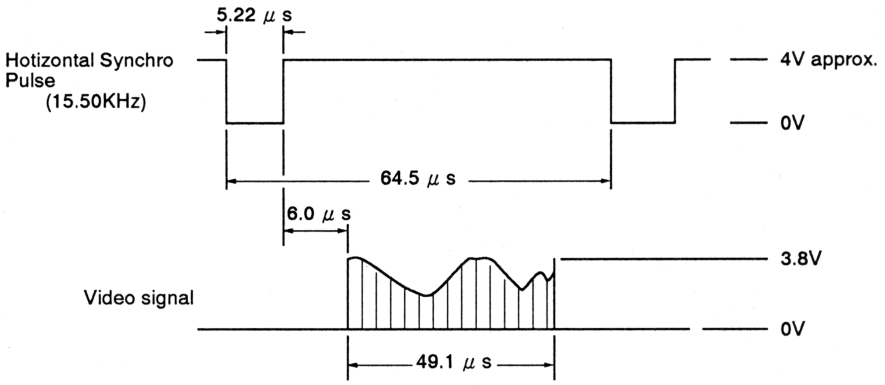
Board	Test Point	Test Item	Ratings
POWER SUPPLY (PTU-9048)	TP1	#1: +12V	12.2V ± 0.1Vdc (adjusted by VR1)
		#2: +5V	5.0V ± 0.25Vdc
		#3: GND (0V)	— (base of voltage measurement)
	J1	#1: -12V	-11.6V to -12.8Vdc
		#4: ANT+12V	11.2V to 12.3Vdc
		#8: GND (0V)	— (base of voltage measurement)
	TP2 TP3 DC[-]	Inverter Frequency	90kHz ± 5% (*DC[-] is floating from chassis.)
PROCESSOR (SPU-9046)	J52	#5: Trigger #1: GND (0V)	 1934Hz to 2138Hz (short range) 1140Hz to 1260Hz (medium range) 560Hz to 620Hz (long range)

Jumper/DIP Switch Setting

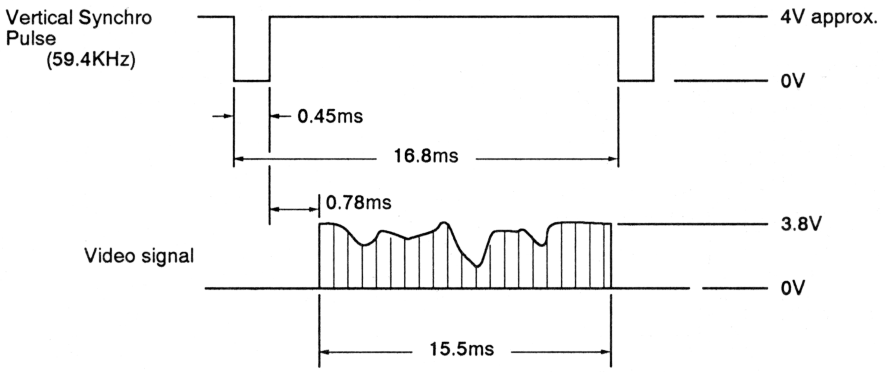
<table>
<tr><th></th><th rowspan="2">Board</th><th colspan="3">Jumper</th><th rowspan="2">Function</th></tr>
<tr><th colspan="2">No.</th><th>Factory Setting</th></tr>
<tr><td rowspan="10">M1721/31/51/61</td><td rowspan="10">PROCESSOR
(SPU-9046)</td><td colspan="2">JUP1</td><td>Short</td><td>Loop current selection for DATA IN port
Short: Furuno CIF
Open: NMEA0183</td></tr>
<tr><td colspan="2">JUP2
(A/B)</td><td>A: M1721/51
B: M1731/61</td><td>Selection of maximum tuning voltage
Jumper on A side: +12V
Jumper on B side: +32V</td></tr>
<tr><td rowspan="8">S1
(DIP)</td><td>#1</td><td rowspan="2">Depends on model.
(See right.)</td><td rowspan="2">Model selection
<table><tr><th></th><th>M1721</th><th>M1731</th><th>M1751</th><th>M1761</th></tr><tr><td>#1</td><td>ON</td><td>OFF</td><td>ON</td><td>OFF</td></tr><tr><td>#2</td><td>ON</td><td>ON</td><td>OFF</td><td>OFF</td></tr></table></td></tr>
<tr><td>#2</td></tr>
<tr><td>#3</td><td>OFF</td><td>Operation mode selection
OFF: Master mode, ON: Slave mode</td></tr>
<tr><td>#4</td><td>OFF</td><td>OFF: Tx even if bearing pulse is missing.
ON: Suspend Tx if bearing pulse is missing.</td></tr>
<tr><td>#5</td><td>OFF</td><td>OFF: Work with new scanner. (M1721/51)
ON: Work with old scanner. (M1720/50)</td></tr>
<tr><td>#6</td><td>OFF</td><td rowspan="3">No function assigned
(Keep these switches OFF.)</td></tr>
<tr><td>#7</td><td>OFF</td></tr>
<tr><td>#8</td><td>OFF</td></tr>
</table>

Potentiometer

	Board	VR No.	Purpose	Adjusted to
M1721	POWER SUPPLY (PTU-9047)	VR1 (VOLT ADJ)	+12V adj.	12.2 ± 0.1V at TP1 #1
M1731/51/61	POWER SUPPLY (PTU-9048)	VR1 (12V)	+12V adj.	12.2 ± 0.1V at TP1 #1
		VR2 (5V)	+5V adj.	5.0 ± 0.25V at TP1 #2
		VR3 (H VOLT)	Input overvolt. protection	Power shuts down at mains input of 42V to 44V.

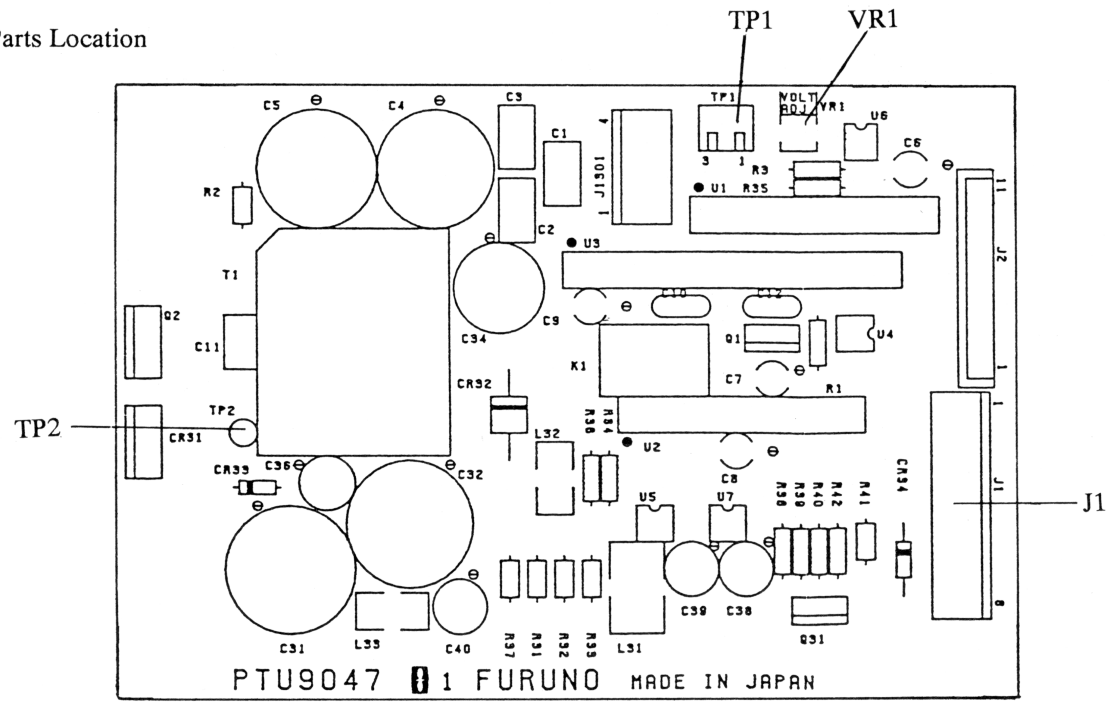


(a) Timing Chart Between Horizontal Synchro Pulse and Video Signal



(a) Timing Chart Between Vertical Synchro Pulse and Video Signal

Synchro Pulses and Video Signal



PTU-9047 Board of Model 1721

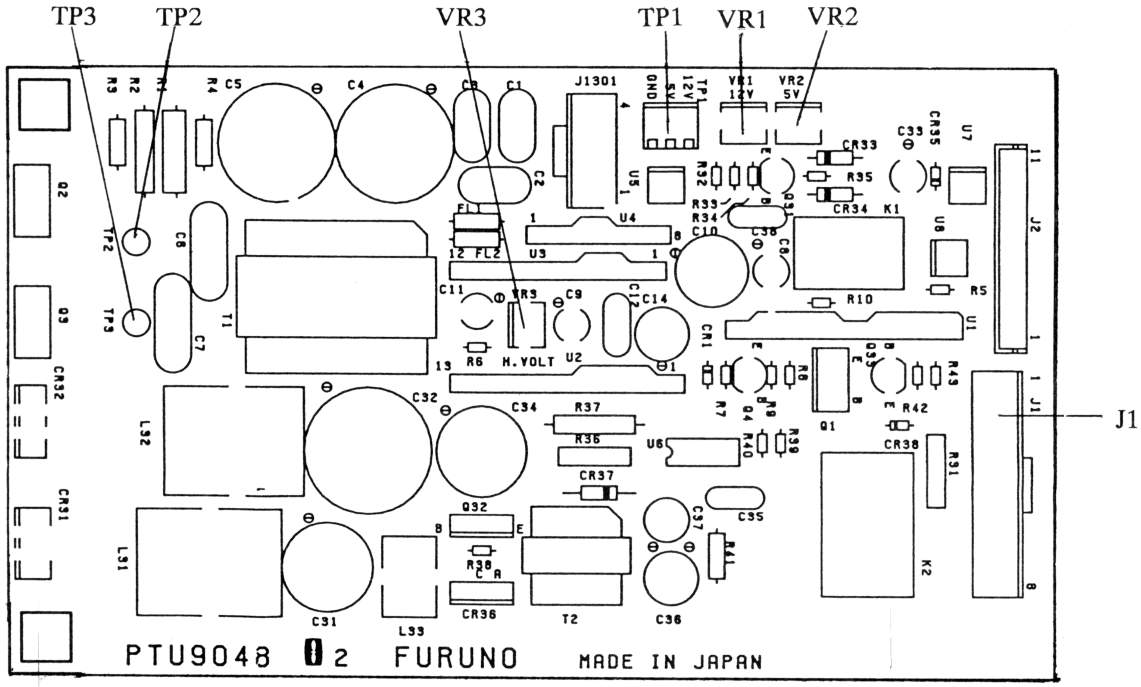
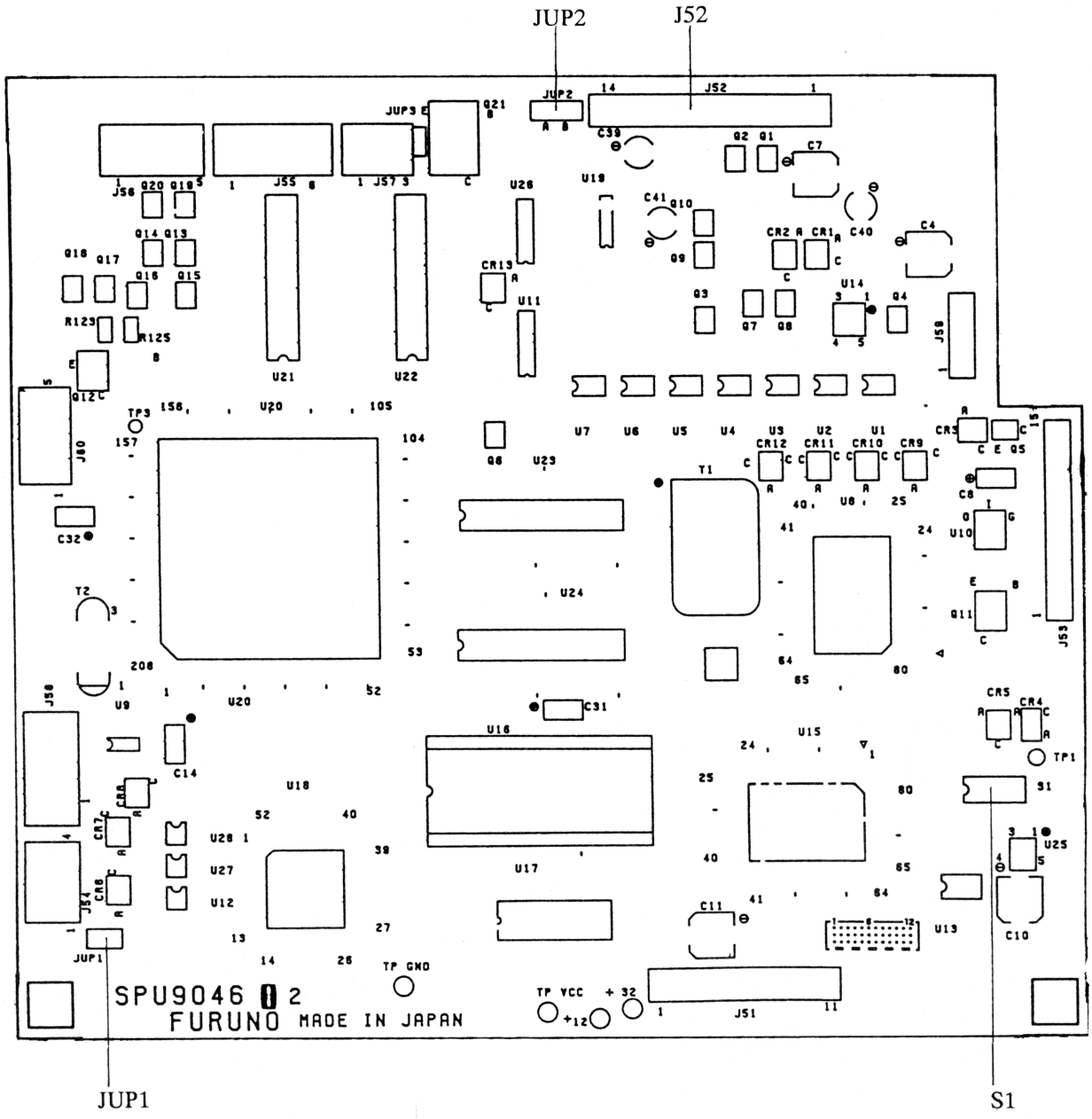


Figure 3-5 PTU-9048 Board of Model 1731, 1751 and 1761



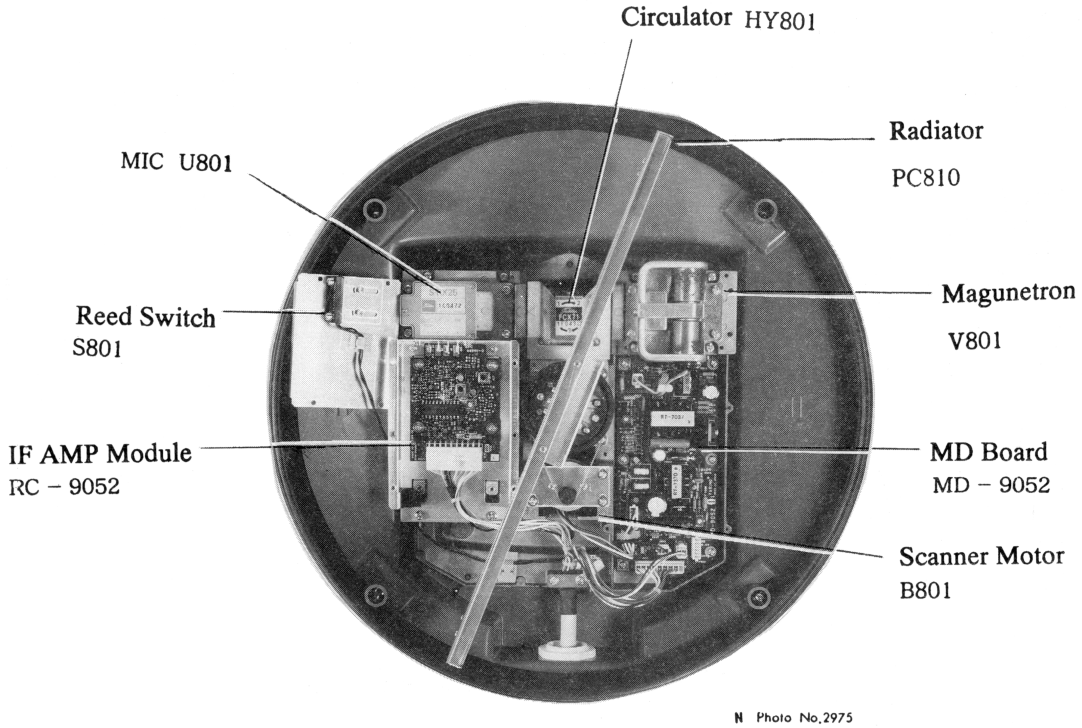
SPU-9046 Board (Processor Board)

ADJUSTMENT OF SCANNER UNIT

Adjustment of Model 1721

N Photo No.2381

Scanner Unit



N Photo No.2975

Inside of Scanner Unit

Test Points of Model 1721

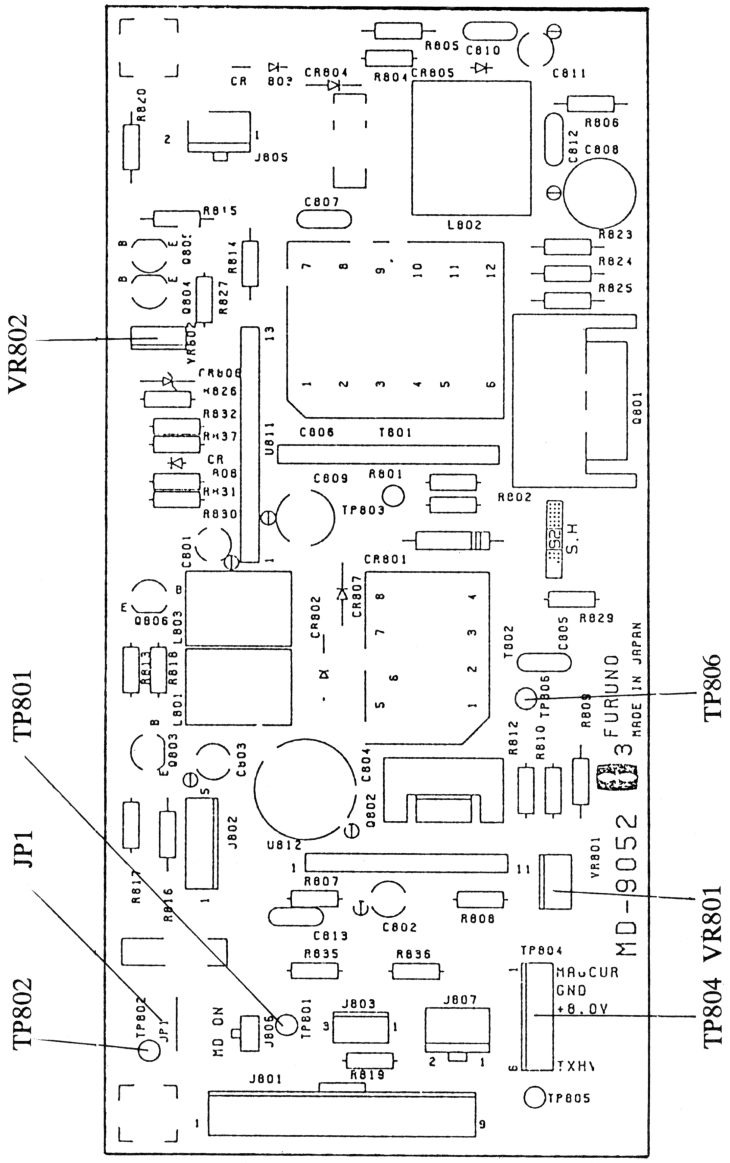
Board	Test Point	Test Item	Ratings
MODULATOR (MD-9052)	TP801	Trigger (in)	Same as J52 #5 on PROCESSOR booard
	TP802	0V (GND)	—
	TP804	#1: Mag. Curr.	1.3V ± 0.1V with new magnetron (Tx, long range)
		#2: 0V(GND)	—
		#3: Mag. heater	8.1V ± 0.1V (ST-BY)
		#6: TX HV	340V to 370V (ST-BY) 310V to 330V (Tx, long range)
	TP806	FET drain	85.4kHz to 94.5kHz

Jumper Setting

Board	Jumper		Function
	No.	Factory Setting	
MODULATOR (MD-9052)	JP1	Short	Scanner motor power control Short: Power ON, Open: Power OFF

Potentiometer

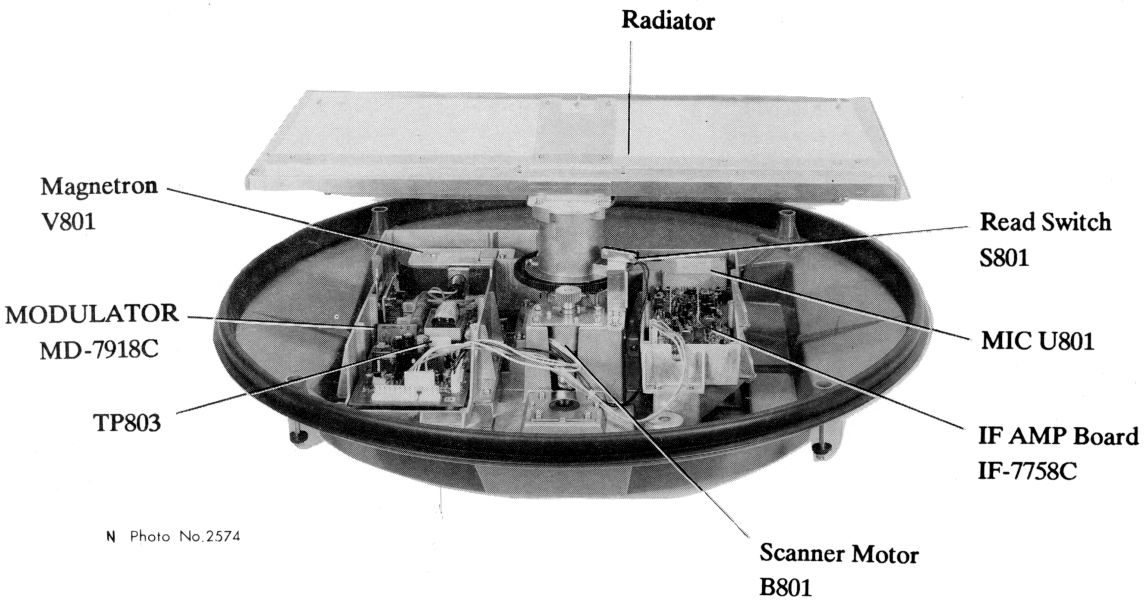
Board	Test Point	Test Item	Ratings
MODULATOR (MD-9052)	VR801	Magnetron heater voltage adj.	8.1 ± 0.1V at TP804 #3(+) and #2(-) (ST-BY)
	VR802	Magnetron current adj.	1.3V ± 0.1V at TP804 #1(+) and #2(-) (Tx, long range, with new magnetron)



MD-9052 Board of Model 1721

N Photo No.2575

Scanner Unit

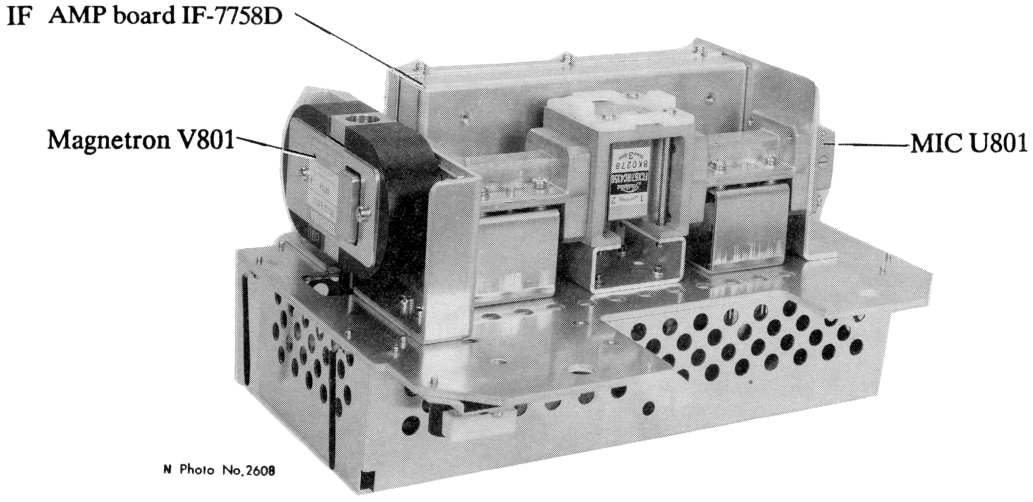


N Photo No.2574

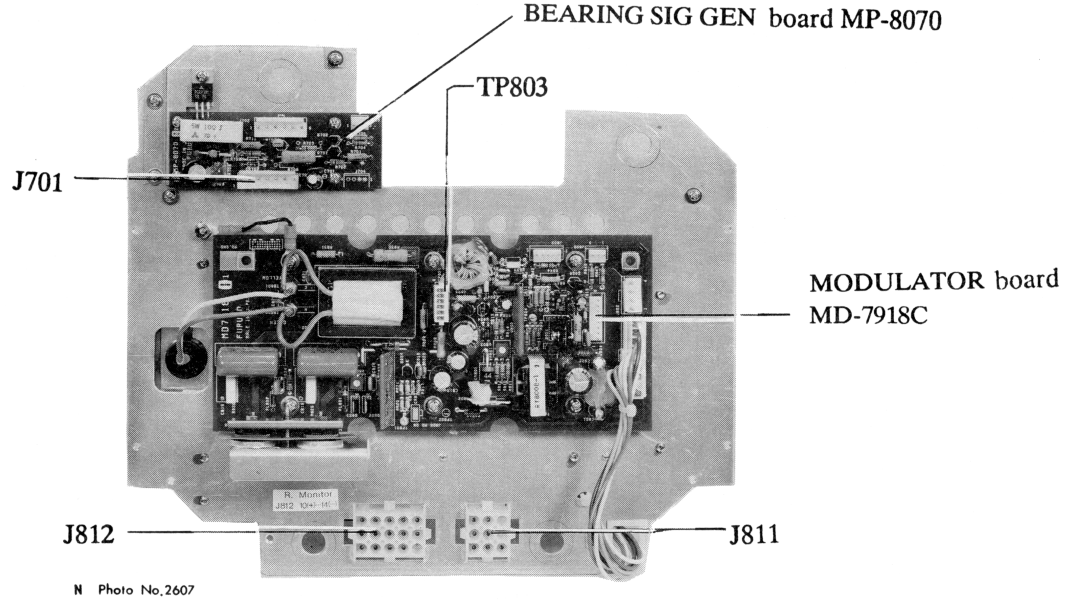
Inside of Scanner Unit

N Photo No.949 P C

Scanner Unit



N Photo No.2608



N Photo No.2607

Transceiver Module

Test Points

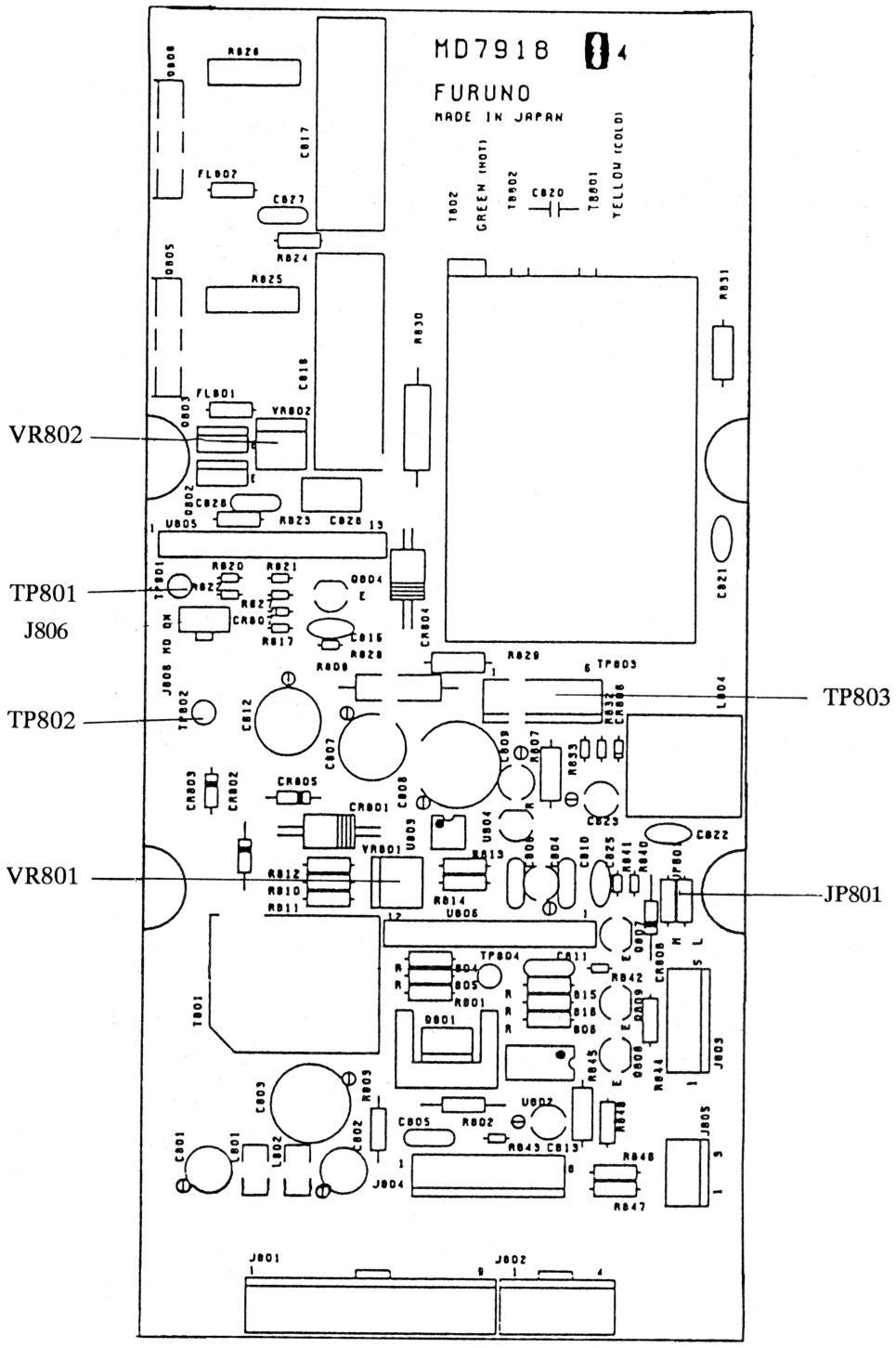
Board	Test Point	Test Item	Ratings
MODULATOR (MD-7918C)	TP801	Trigger (in)	Same as J52 #5 on PROCESSOR board
	TP802	0V (GND)	— (base of measurement)
	TP803	#1: TX HV	330V to 370V (ST-BY) 290V to 330V (Tx, long range)
		#2: 0V(GND)	— (base of voltage measurement)
		#3: +14V	13V to 17Vdc
		#4: Mag. heater	7.5V ± 0.1V (ST-BY, adjusted by VR801)
		#5: Mag. Curr.	1.0V ± 0.1V with new magnetron
		#6: GND (0V)	— (base of voltage measurement)
IF AMP (IF-7758C/D)	TP601	Noise Figure	factory measurement only
	TP602	GND	—
	TP603	Video signal	4Vpp approx. (measure at main bang)
	TP604	Gain/STC monitor	Voltage changes when GAIN or A/C SEA control is turned.
	TP605	Tuning indicator	Voltage changes depending on tuning condition.
	J611 #9(-) J613 #2(+)	R. Monitor (MIC)	1.5V to 3.3Vdc on ST-BY for Model 1731 1.7V to 4.5Vdc on ST-BY for Model 1761 (just for reference)

Jumper Setting

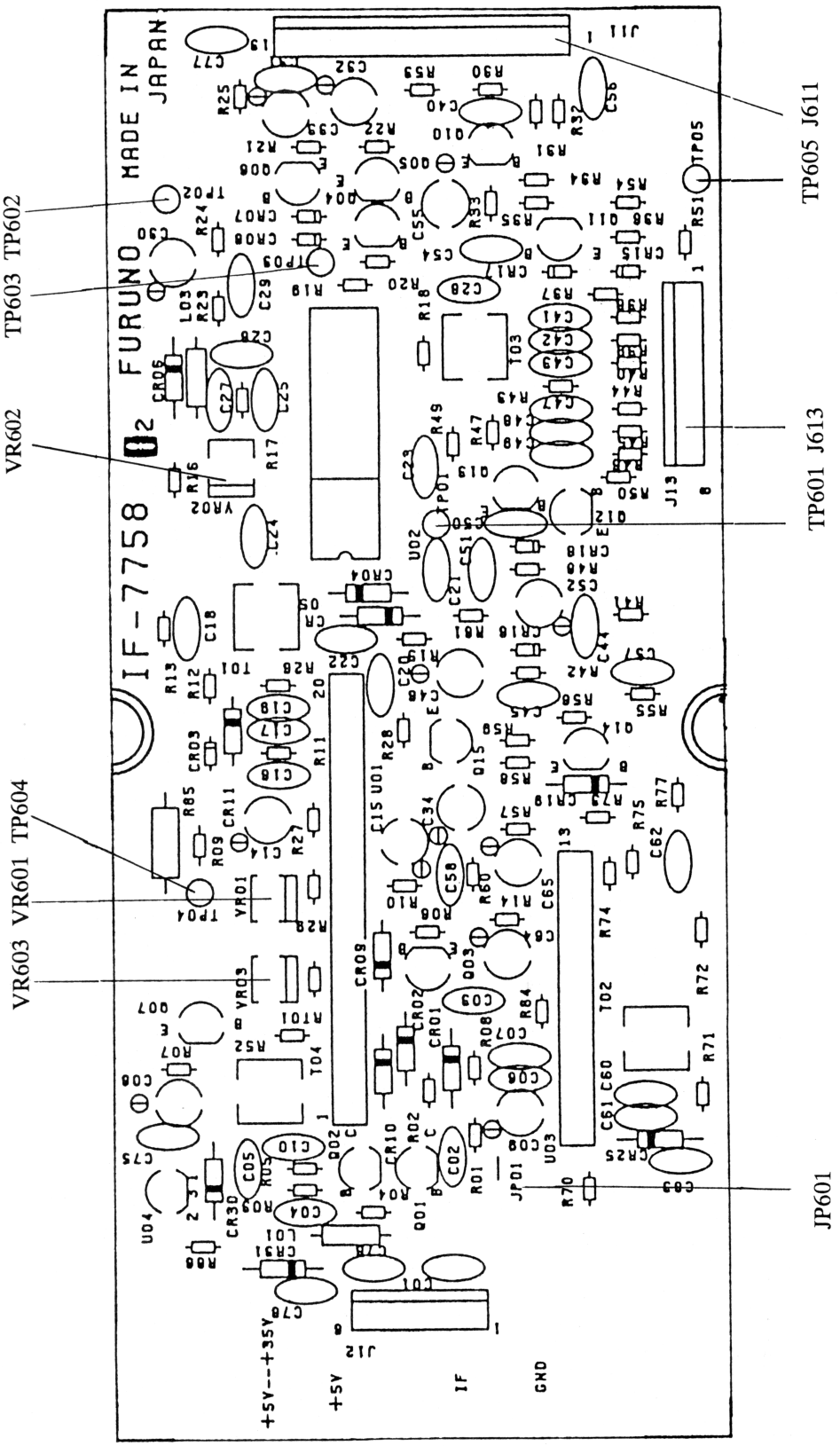
Board	Jumper No.		Factory Setting	Function
MODULATOR (MD-7918C)	JP801	L	Short	Selection of IF bandwidth "M" shorted: 3MHz for medium and long pulses "L" shorted: 3MHz for long pulse only
		M	Open	
	J806		Short	Suspend transmission or no
IF AMP (IF-7758C/D)	JP601 (JP01)		Depends on model. (See right.)	Short: No gain control to first stage (M1731) Open: Gain control to first stage (M1761)

Jumper Setting

Board	VR No.	Purpose	Adjustment to
MODULATOR (MD-7918C)	VR801	Magnetron heater voltage adj.	7.5V ± 0.1V at TP803 #4(+) and #6(-) (ST-BY)
	VR802	Magnetron current adj.	1.0V ± 0.1V at TP803 #5(+) and #6(-) (Tx, long range, with new magnetron)
IF AMP (IF-7758C/D)	VR601 (VR01) VR602 (VR02) VR603 (VR03)	STC/Gain characteristics adj.	Note: Only VR602 may be adjusted in the field to set total amp gain.



MODULATOR pcb MD-7918

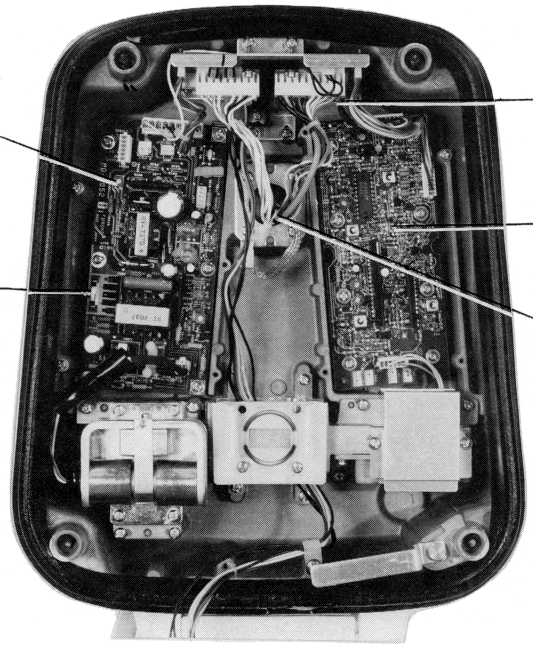


IF AMP pcb IF-7758

Adjustment of Model 1751

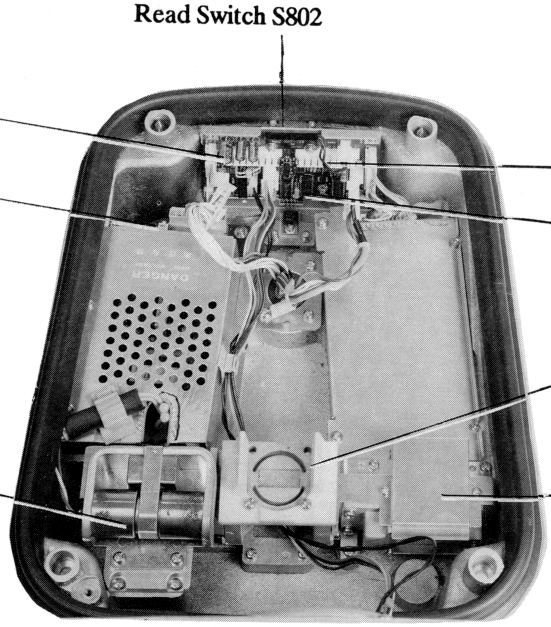
N Photo No.2825

Scanner Unit



N Photo No.2976

Inside of Scanner Unit
(cover removed)



N Photo No.2743

Inside of Scanner Unit

Test Points

Board	Test Point	Test Item	Ratings
MODULATOR (MD-9052)	TP801	Trigger (in)	Same as J52 #5 on PROCESSOR board
	TP802	0V (GND)	—
	TP804	#1: Mag. Curr.	1.3V ± 0.1V with new magnetron (Tx, long range)
		#2: 0V(GND)	—
		#3: Mag. heater	8.1V ± 0.1V (ST-BY)
		#6: TX HV	340V to 370V (ST-BY) 310V to 330V (Tx, long range)
	TP806	FET drain	85.4kHz to 94.5kHz
IF AMP (IF-7758C)	TP601	Noise Figure	factory measurement only
	TP602	GND	—
	TP603	Video signal	4Vpp approx. (measure at main bang)
	TP604	Gain/STC monitor	Voltage changes when GAIN or A/C SEA control is turned.
	TP605	Tuning indicator	Voltage changes depending on tuning condition.
	J611 #9(-) J613 #2(+)	R. Monitor (MIC)	1.3V to 2.7Vdc on ST-BY (just for reference)

Jumper Setting

Board	Jumper		Function
	No.	Factory Setting	
MODULATOR (MD-9052)	JP1	Short	Scanner motor power control Short: Power ON, Open: Power OFF See page 3-10
IF AMP (IF-7758C)	JP601 (JP01)	Depends on model. (See right.)	Short: No gain control to first stage See page 3-16

Potentiometer

Board	VR No.	Purpose	Adjustment to
MODULATOR (MD-9052)	VR801	Magnetron heater voltage adj.	8.1V ± 0.1V at TP804 #3(+) and #2(-) (ST-BY) See page 3-10
	VR802	Magnetron current adj.	1.0V ± 0.1V at TP803 #5(+) and #6(-) (Tx, long range, with new magnetron) See page 3-10
IF AMP (IF-7758C)	VR601 (VR01) VR602 (VR02) VR603 (VR03)	STC/Gain characteristics adj.	Note: Only VR602 may be adjusted in the field to set total amp gain. See page 3-16

CHAPTER 4. MAINTENANCE

RECOMMENDED MAINTENANCE CHECKS

Interval	Check Point	Check/Measures	Remarks
3 to 6 months	Exposed nuts and bolts on scanner unit	Check for corroded or loosened nuts and bolts. If necessary, clean and repaint thickly. Replace if heavily corroded.	Sealing compound may be used instead of paint. Lightly coat new nuts and bolts with grease.
	Scanner radiator	Check for dirt or cracks on the radiator surface. Thick dirt should be wiped off by using a soft cloth immersed in fresh water. If radiator is cracked, apply a slight amount of sealing compound or adhesive as a temporary remedy, then call for service.	**DO NOT use plastic solvents such as acetone for cleaning.** To remove ice on the scanner unit, use a wooden hammer or plastic-head hammer to prevent damage. Crack on the unit may cause water leakage, which can permanently damage the circuits inside.
	Terminal boards and plugs in scanner unit	Open scanner cover to check terminal boards and plugs inside. Also, check the rubber packing on the scanner cover for cracks.	When refitting the cover, be careful not to catch flying wires between cover and unit.
	CRT screen	Dirt on CRT creates symptoms indentical to poor sensitivity. Clean CRT surface carefully.	Use a soft cloth with a slight amount of anti-static-charge spray. **NEVER USE PLASTIC SOLVENTS.**
once a year	CRT anode and approach	High tension on CRT attracts dust and moist dust will cause poor insulation.	If rubber cap or wire sheath is cracked, replace damaged part.
	Sockets and plugs	Check for loose connections. Clean contacts or replace plug, if necessary.	

LIFE EXPECTANCY OF EXPENDABLE PARTS

(FOR REFERENCE ONLY)

Parts	Type	Code No.	Life expectancy *1	Remarks
Scanner motor	RM-9087	000-125-790	more than 5,000 hrs.	for Model 1731
	RM-8025	000-116-125	more than 10,000 hrs.	for Model 1761
	RM-8629	000-120-308	〃	for Model 1751 brushless
	RM-9086	000-125-789	more than 5,000 hrs	for Model 1721
Magnetron *3	9M302/ E3513, L	000-101-733	5000 hrs. approx. *2	for Model 1731/1761
	E3554(E3561)	000-119-503	3,000 hrs. approx. *2	for Model 1721/1751
	or MG 5353	000-117-473		

*1: Under normal operating conditions.
*2: Hours during ST-BY are included.
*3: When changing magnetron, use NON-MAGNETIC type tools listed below.

List of Special Tools for Magnetron

Name	Type	Code No.
Hex nut driver (Non-magnetic)	7 × 125, SUS304, M4	000-804-606
Hex nut driver (Non-magnetic)	10 × 125, SUS304, M6	000-804-607
- screwdriver	1B-25100	000-801-690
+screwdriver	1B-27100	000-801-689
Open end wrenches	1B-12010-B, B5 & M6 8 × 10•L=120	000-801-647
T-type wrench	1B-32010-D, M6 10NM diagonal	000-801-648

MAINTENANCE PARTS LIST FOR MODEL 1721 NO.M31A00

*1:DEPOT MAINTENANCE PARTS FOR 10 SETS IN 2 YEARS
*2:SHIPBORNE RUNNING PARTS FOR 1 SET IN 2 YEARS

CODE NO.	NAME OF PARTS	TYPE	SPECIFICATIONS	QUANTITY *1	QUANTITY *2	REMARKS
000-114-834	MAGNETRON	E3554M	03S7729	5	1	
000-117-473	MAGNETRON	MG5353	03S8340	5	1	
000-126-172	MIC FOR X-BAND	S-RX25	03S7407-3	3	1	
000-112-785	FUSE	FGMB 5A	AC125V	30	10	
000-125-968	CRT DISPLAY ASSEMBLY	A1QA9DSP45	03S7095-7	2	1	
000-125-914	IF AMP MODULE	RC-9052	MODEL1721	3	1	
008-428-780	PRINTED CIRCUIT BOARD	PNL-9043	M1721/31/51/61	2	1	
008-428-790	PRINTED CIRCUIT BOARD	VOL-9044	M1721/31/51/61	2	1	
008-428-810	PRINTED CIRCUIT BOARD	TB-9045	M1721/31/51/61	3	1	
008-428-860	PRINTED CIRCUIT BOARD	FIL-9049	M1721/31/51/61	3	1	
008-428-880	PRINTED CIRCUIT BOARD	SPU-9046A	MODEL1721	3	1	
008-429-100	PRINTED CIRCUIT BOARD	MD-9052	MODEL1721/1751	3	1	
008-431-230	PRINTED CIRCUIT BOARD	PTU-9047	MODEL1721	3	1	
000-117-630	REED SWITCH	NRS-101-56	03S8520-0	3	1	
000-125-789	ENCORDER MOTOR	RM-9086 (BRUSHLESS)	M1720/1721	3	1	

MAINTENANCE PARTS LIST NO.M31B00
FOR MODEL 1731

*1:DEPOT MAINTENANCE PARTS FOR 10 SETS IN 2 YEARS
*2:SHIPBORNE RUNNING PARTS FOR 1 SET IN 2 YEARS

CODE NO.	NAME OF PARTS	TYPE	SPECIFICATIONS	QUANTITY *1	QUANTITY *2	REMARKS
000-101-733	MAGNETRON FOR CKD	9M302/E3513L,9410MHZ	03S5676-1	5	1	
000-115-548	M.I.C. ASSEMBLY	RU-8015		3	1	
000-104-815	FUSE, GLASS TUBE TYPE	FGMB 10A AC125V		30	10	FOR 12VDC
000-112-785	FUSE	FGMB 5A	AC125V	30	10	FOR 24/32VDC
000-125-968	CRT DISPLAY ASSEMBLY	A1QA9DSP45	03S7095-7	2	1	
008-390-540	PRINTED CIRCUIT BOARD	IF-7758C	M1730/50/1830	3	1	
008-428-780	PRINTED CIRCUIT BOARD	PNL-9043	M1721/31/51/61	2	1	
008-428-790	PRINTED CIRCUIT BOARD	VOL-9044	M1721/31/51/61	2	1	
008-428-810	PRINTED CIRCUIT BOARD	TB-9045	M1721/31/51/61	3	1	
008-428-860	PRINTED CIRCUIT BOARD	FIL-9049	M1721/31/51/61	3	1	
008-428-890	PRINTED CIRCUIT BOARD	SPU-9046B	MODEL1731	3	1	
008-429-180	PRINTED CIRCUIT BOARD	MD-7918C	MODEL1731/1761	3	1	
008-431-240	PRINTED CIRCUIT BOARD	PTU-9048	M1731/51/61	3	1	
000-117-630	REED SWITCH	NRS-101-56	03S8520-0	3	1	
000-125-790	ENCORDER MOTOR	RM-9087 (BRUSHLESS)	M1731/1830,7010	3	1	

MAINTENANCE PARTS LIST NO.M31C00
FOR MODEL 1751

*1:DEPOT MAINTENANCE PARTS FOR 10 SETS IN 2 YEARS
*2:SHIPBORNE RUNNING PARTS FOR 1 SET IN 2 YEARS

CODE NO.	NAME OF PARTS	TYPE	SPECIFICATIONS	QUANTITY *1	QUANTITY *2	REMARKS
000-114-834	MAGNETRON	E3554M	03S7729	5	1	
000-117-473	MAGNETRON	MG5353	03S8340	5	1	
008-402-530	MIC ASSEMBLY	S-RX25/03P8658 ETC	M-1750/1751	3	1	
000-104-815	FUSE, GLASS TUBE TYPE	FGMB 10A AC125V		30	10	FOR 12VDC
000-112-785	FUSE	FGMB 5A	AC125V	30	10	FOR 24/32VDC
000-125-968	CRT DISPLAY ASSEMBLY	A1QA9DSP45	03S7095-7	2	1	
008-390-540	PRINTED CIRCUIT BOARD	IF-7758C	M1730/50/1830	3	1	
008-428-780	PRINTED CIRCUIT BOARD	PNL-9043	M1721/31/51/61	2	1	
008-428-790	PRINTED CIRCUIT BOARD	VOL-9044	M1721/31/51/61	2	1	
008-428-810	PRINTED CIRCUIT BOARD	TB-9045	M1721/31/51/61	3	1	
008-428-860	PRINTED CIRCUIT BOARD	FIL-9049	M1721/31/51/61	3	1	
008-428-900	PRINTED CIRCUIT BOARD	SPU-9046C	MODEL1751	3	1	
008-429-210	PRINTED CIRCUIT BOARD	03P8630A INT	M1751	3	1	
008-431-240	PRINTED CIRCUIT BOARD	PTU-9048	M1731/51/61	3	1	
000-117-630	REED SWITCH	NRS-101-56	03S8520-0	5	2	
000-120-308	MOTOR	RM-8629	03S8629	3	1	
008-429-110		MD-9052	RTR-033	3	1	

MAINTENANCE PARTS LIST FOR MODEL 1761 NO.M31D00

*1:DEPOT MAINTENANCE PARTS FOR 10 SETS IN 2 YEARS
*2:SHIPBORNE RUNNING PARTS FOR 1 SET IN 2 YEARS

CODE NO.	NAME OF PARTS	TYPE	SPECIFICATIONS	QUANTITY *1	QUANTITY *2	REMARKS
000-101-733	MAGNETRON FOR CKD	9M302/E3513L,9410MHZ	03S5676-1	5	1	
008-375-760	MIC ASSEMBLY	RU-8014/MIC-8071	M-1930/1940	3	1	
000-104-815	FUSE, GLASS TUBE TYPE	FGMB 10A AC125V		30	10	FOR 12VDC
000-112-785	FUSE	FGMB 5A	AC125V	30	10	FOR 24/32VDC
000-125-968	CRT DISPLAY ASSEMBLY	A1QA9DSP45	03S7095-7	2	1	
008-375-780	PRINTED CIRCUIT BOARD	MP-8070 BEARING SG	M1930/40,FR7040	3	1	
008-428-780	PRINTED CIRCUIT BOARD	PNL-9043	M1721/31/51/61	2	1	
008-428-790	PRINTED CIRCUIT BOARD	VOL-9044	M1721/31/51/61	2	1	
008-428-810	PRINTED CIRCUIT BOARD	TB-9045	M1721/31/51/61	3	1	
008-428-860	PRINTED CIRCUIT BOARD	FIL-9049	M1721/31/51/61	3	1	
008-428-910	PRITNTED CIRCUIT BOARD	SPU-9046D	MODEL1761	3	1	
008-429-180	PRINTED CIRCUIT BOARD	MD-7918C	MODEL1731/1761	3	1	
008-431-240	PRINTED CIRCUIT BOARD	PTU-9048	M1731/51/61	3	1	
008-437-330	PRINTED CIRCUIT BOARD	IF-7758D	IF AMP	3	1	
000-118-533	REED SWITCH	RS-1,NO	03S8621-0	3	1	
000-116-125	MOTOR	RM-8025	03S8025-0	3	1	

CHAPTER 5. TROUBLESHOOTING

TROUBLESHOOTING MATRIX TABLE

This section provides a troubleshooting matrix table which helps the service technician to quickly identify defective pcbs or blocks. To use the table, locate the symptom in one of the three columns of the table. Possibly defective circuits and their likelihood of defectiveness, indicated by a circle, star or triangle, corresponding to 70-80%, approximately 20% and a few percent respectively, are listed in each column. Numeral inside circle shows possibility of error; the smaller the number, the higher the possibility.

NOTE: Check the ship's mains for proper voltage before using the matrix table.

	Symptom	ⓐ Power can not be supplied. ⓑ Power is supplied but nothing appears on CRT. ⓒ Scanner does not rotate.			ⓓ Marks and characters do not appear. ⓔ Marks/characters appear, but no echo nor noise. ⓕ Marks, characters and noise appear, but no echo.			ⓖ Echo appears, but poor sensitivity. ⓗ Incorrect target bearing. ⓘ Keyboard is pressed but no response. ⓙ Trackball does not work.			
	Check Points	ⓐ	ⓑ	ⓒ	ⓓ	ⓔ	ⓕ	ⓖ	ⓗ	ⓘ	ⓙ
Display Unit	Filter Board (FIL-9049)	☆									
	Power Supply Board (PTU-9047)	②	△	①							
	Processor Board (SPU-9046A)		☆	△	①	②	☆	☆	②	②	②
	Panel Board (PNL-9043)	△								①	
	Pot. Board (VOL-9044)					△		△			
	Trackball Assy (TB-9045)										①
	CRT Unit (A1QA9DSP45)		△								
	Fuse (F1351, 5A)	①									
Cable	Scanner Cable			☆		☆			☆		
Scanner Unit	Modulator (MD-9052)			△			①		☆		
	IF Amp Module (RC-9052)					①	☆	③			
	MIC (S-RX25, A)					③	☆	②			
	Magnetron (E3554(E3561) or MG5353)						②	①			
	Circulator (FCX71)							☆			
	Scanner Motor (RM-9086)			②					①		
	Heading Reed Sw (NRS-101-56)								②		

Likelihood of defectiveness ○ : Most probable ☆ : Probable △ : Could be

Symptom / Check Points		ⓐ Power can not be supplied. ⓑ Power is supplied but nothing appears on CRT. ⓒ Scanner does not rotate.			ⓓ Marks and characters do not appear. ⓔ Marks/characters appear, but no echo nor noise. ⓕ Marks, characters and noise appear, but no echo.			ⓖ Echo appears, but poor sensitivity. ⓗ Incorrect target bearing. ⓘ Keyboard is pressed but no response. ⓙ Trackball does not work.			
		ⓐ	ⓑ	ⓒ	ⓓ	ⓔ	ⓕ	ⓖ	ⓗ	ⓘ	ⓙ
Display Unit	Filter Board (FIL-9049)	☆									
	Power Supply Board (PTU-9048)	②	△	①							
	Processor Board (SPU-9046B)		☆	△	①	②	☆	☆	②	②	②
	Panel Board (PNL-9043)	△								①	
	Pot. Board (VOL-9044)					△		△			
	Trackball Assy (TB-9045)										①
	CRT Unit (A1QA9DSP45)		①								
	Fuse (F1351, 5A:24/32V, 10A:12V)	①									
Cable	Scanner Cable			☆		☆			☆		
Scanner Unit	Modulator (MD-7918C)			△			①		☆		
	IF Amp (IF-7758C)					①	☆	③			
	MIC (RU-8015)					③	☆	②			
	Magnetron (9M302/E3513)						②	①			
	Circulator (FCX73)							☆			
	Scanner Motor (RM-9087)			②					①		
	Heading Reed Sw (NRS-101-56)								②		

Likelihood of defectiveness ○ : Most probable ☆ : Probable △ : Could be

	Symptom	ⓐ Power can not be supplied. ⓑ Power is supplied but nothing appears on CRT. ⓒ Scanner does not rotate.			ⓓ Marks and characters do not appear. ⓔ Marks/characters appear, but no echo nor noise. ⓕ Marks, characters and noise appear, but no echo.			ⓖ Echo appears, but poor sensitivity. ⓗ Incorrect target bearing. ⓘ Keyboard is pressed but no response. ⓙ Trackball does not work.			
	Check Points	ⓐ	ⓑ	ⓒ	ⓓ	ⓔ	ⓕ	ⓖ	ⓗ	ⓘ	ⓙ
Display Unit	Filter Board (FIL-9049)	☆									
	Power Supply Board (PTU-9048)	②	△	①							
	Processor Board (SPU-9046C)		☆	△	①	②	☆	☆	②	②	②
	Panel Board (PNL-9043)	△								①	
	Pot. Board (VOL-9044)					△		△			
	Trackball Assy (TB-9045)										①
	CRT Unit (A1QA9DSP45)		①								
	Fuse (F1351, 5A:24/32V, 10A:12V)	①									
Cable	Scanner Cable			☆		☆			☆		
Scanner Unit	Modulator (MD-9052)						①		☆		
	IF Amp (IF-7758C)					①	☆	③			
	Interface Board (03P8630A)			△		△			△		
	MIC (S-RX25, A)					③	☆	②			
	Magnetron (E3554(E3561) or MG5353)						②	①			
	Circulator (FCX71)							☆			
	Scanner Motor (RM-8629)			②					①		
	Heading Reed Sw (NRS-101-56)								②		
	Tx Stop Reed Sw (NRS-101-56)						△				

Likelihood of defectiveness ○ : Most probable ☆ : Probable △ : Could be

	Symptom	ⓐ Power can not be supplied. ⓑ Power is supplied but nothing appears on CRT. ⓒ Scanner does not rotate.			ⓓ Marks and characters do not appear. ⓔ Marks/characters appear, but no echo nor noise. ⓕ Marks, characters and noise appear, but no echo.			ⓖ Echo appears, but poor sensitivity. ⓗ Incorrect target bearing. ⓘ Keyboard is pressed but no response. ⓙ Trackball does not work.			
		ⓐ	ⓑ	ⓒ	ⓓ	ⓔ	ⓕ	ⓖ	ⓗ	ⓘ	ⓙ
	Check Points										
Display Unit	Filter Board (FIL-9049)	☆									
	Power Supply Board (PTU-9048)	②	△	①							
	Processor Board (SPU-9046D)		☆	△	①	②	☆	☆	②	②	②
	Panel Board (PNL-9043)	△								①	
	Pot. Board (VOL-9044)					△		△			
	Trackball Assy (TB-9045)										①
	CRT Unit (A1QA9DSP45)		△								
	Fuse (F1351, 5A:24/32V, 10A:12V)	①									
Cable	Scanner Cable			☆		☆			☆		
Scanner Unit	Modulator (MD-7918C)						①		☆		
	IF Amp (IF-7758D)					①	☆	③			
	Bearing Sig Gen (MP-8070)			△							
	MIC (RU-8014)					③	☆	②			
	Magnetron (9M302/E3513)						②	①			
	Circulator (RC-4356)							☆			
	Scanner Motor (RM-8025)			②					①		
	Heading Reed Sw (NRS-101-56)								②		

Likelihood of defectiveness ○ : Most probable ☆ : Probable △ : Could be

MESSAGES ON CRT

The following messages appear to call the operator's attention to missing heading, bearing or gyro pulses.

Message	Meaning
HD SIG MISSING	Heading pulse not applied to the SPU pcb. The heading mark disappears.
BRG SIG MISSING	Bearing pulse is not applied to the SPU pcb. Radar automatically changes from TX to ST-BY mode. This message is also displayed when neither heading pulse nor bearing pulse is applied.
MAG ○○○ . ○° or GYRO ○○○ . ○° (Figure blinks)	When the data are missing, the heading data blinks. Case1. If the heading data is missing press the [HM OFF] key to try to resrore it. Case2. If the heading data can not be restored, "MAG (or GYRO) ○○○ . ○° " completely disappears when pressing the [HM OFF] key. Check associated circuits for proper operation to restore heading data. Then, press the [HM OFF] key to restore the indication.

The following message(s) appear and blink during equipment warmup if item displayed was not adjusted at installation.

Message	Meaning
HEADING TIMING or TUNE PEAK	"Relative bearing alignment", "Sweep timing" or "Auto tuning" not adjusted. Adjust the item displayed, referring to "6. INSTALLATION" of the operator's manual.

HISTORY OF PROGRAM VERSION NO.

Programable ROM U16 is on SPU pcb SPU-9046. It is commonly used in all Model 1721/1731/1751/1761 radars.

PROM

Parts No.	Program No.	Data revised	Remarks
U16	03590361-06	March 1992	Bugs are deleted
	03590361-07	April 1992	Corrected Alarm Zone setting
	03590361-08	June 1992	Bugs are deleted at FTC
	03590361-09	July 1992	1. Automatic tuning is improved 2. BWR is added to NMEA input line
	03590361-10	August 1992	Automatic tuning is improved
	03590361-11	November 1992	Same as above

FURUNO

ELECTRICAL PARTS LIST
電気部品表

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MODEL	M1721/31/51/61			
UNIT	RDP-098/099			PAGE
REF. DWG.	C3359-K01-C	BLOCK NO.	1B1	1

SYMBOL 記号	TYPE 型名	SPECIFICATIONS 規格	CODE NO. コード番号	REMARKS 備考
	PRINTED CIRCUIT BOARD	プリントキバン		
1B01	DISPLAY CHASSIS			
1B02	PTU-9047	MODEL1721	008-428-840	
	PTU-9048	M1731/51/61	008-428-850	
1B03	SPU-9046A	MODEL1721	008-428-880	
	SPU-9046B	MODEL1731	008-428-890	
	SPU-9046C	MODEL1751	008-428-900	
	SPU-9046D	MODEL1761	008-428-910	
1B04	FIL-9049	M1721/31/51/61	008-428-860	
1B05	PNL-9043	M1721/31/51/61	008-428-780	
1B06	VOL-9044	M1721/31/51/61	008-428-790	
1B07	TB-9045	M1721/31/51/61	008-428-810	
1B08	A1QA9DSP45	03S7095-7	000-125-968	
	CONNECTOR	コネクター		
DJ 1	MCP-24F02	HOUSING	000-500-161	
	MCP-24S6		000-500-169	
	MCP-F102R	PIN CONTACT	000-500-163	22 PCS
	FUSE	ヒューズ		
F 1351	FGMB 5A	AC125V	000-112-785	M1721 AND 24/32VDC SPEC OF M1731/1751/1761
	FGMB 10A	AC125V	000-104-815	12VDC SPEC OF M1731/1751/1761
	FH-043S	00S01560	000-103-164	HOLDER
	JACK	ジャック		
J 1351	FM-142S	2P	000-511-403	
J 1352	MJ-A4SRMD	22S0193-2	000-123-993	
J 1353	MJ-A6SRMD	22S0194-2	000-123-994	
	PLUG	プラク		
P 1	VHR-8N	HOUSING	000-505-892	
	BVH-21T-P1.1	VH CONTACT	000-100-049	8 PCS
P 2	EHR-11	19S0080-0	000-112-756	
	BEH-001T-P0.6	CONTACT	000-108-240	11 PCS
P 24	FS2N50.8A15	FLAT CABLE	000-125-740	
P 51	EHR-11	19S0080-0	000-112-756	
	BEH-001T-P0.6	CONTACT	000-108-240	11 PCS
P 52	EHR-14	19S0080-0	000-125-741	

UNIT	RDP－098／099	REF. DWG.	C3359-K01-C	BLOCK NO.	1B1	2

SYMBOL 記号	TYPE 型名	SPECIFICATIONS 規格	CODE NO. コード番号	REMARKS 備考
	PLUG	プラグ		
	BEH-001T-P0.6	CONTACT	000-108-240	14 PCS
P 54	EHR-4	19S0080-0	000-108-907	
	BEH-001T-P0.6	CONTACT	000-108-240	2 PCS
P 58	EHR-6	19S0080-0	000-125-915	
	BEH-001T-P0.6	CONTACT	000-108-240	4 PCS

UNIT RDP-098/099 | REF. DWG. C3359-K02-C | BLOCK NO. 1B2 | 3

SYMBOL 記号	TYPE 型名	SPECIFICATIONS 規格	CODE NO. コード番号	REMARKS 備考
	PRINTED CIRCUIT BOARD プリントキバン			
	PTU-9047	MODEL1721	008-428-840	
	CAPACITOR コンデンサー			
C 1	ECQ-V1J105JZW	W5.0	000-114-301	
C 2	ECQ-V1J105JZW	W5.0	000-114-301	
C 3	ECQ-V1J105JZW	W5.0	000-114-301	
C 4	ECE-A1HFS471	470UF 50V	000-110-152	
C 5	ECE-A1HFS471	470UF 50V	000-110-152	
C 6	ECE-A1CU330E	33UF 16V	000-201-674	
C 7	ECE-A1CU101E	100UF 16V	000-206-112	
C 8	ECE-A1CU220E	22UF 16V	000-201-806	
C 9	ECE-A1CU220E	22UF 16V	000-201-806	
C 10	ECQ-V1H105JZW	1UF 50V	000-104-801	
C 11	ECQ-M1472KZW	4700PF 100V	000-104-800	
C 12	ECQ-M1H103KVW	0.01UF 50V	000-260-416	
C 13	ECE-A1CU100	10UF 16V	000-201-708	
C 31	ECE-A1CFE332	3300UF 16V	000-118-923	
C 32	ECE-A1CFE332	3300UF 16V	000-118-923	
C 34	ECE-A1AF102	1000UF 10V	000-201-640	
C 36	ECE-A1CU221E	220UF 16V	000-201-673	
C 38	ECE-A1CU101E	100UF 16V	000-206-112	
	DIODE ダイオード			
CR 31	ESAC-92M-02		000-113-275	
CR 32	RK44-LF-K1	C17.5	000-111-765	
CR 33	EU2		000-108-932	
CR 34	RG2Y	13-3-5360	000-134-889	
	FILTER フイルター			
FL 1	FBA03HA450KD-00		000-115-552	
FL 2	FBA03HA450KD-00		000-115-552	
FL 31	FBA03HA450KD-00		000-115-552	
	JACK ジャック			
J 1	B8P-VH	8P	000-505-826	
J 2	B11B-EH-A		000-125-745	
J 1301	B4P-VH	4P	000-505-822	
	RELAY リレー			
K 1	G6EK-134C-DC9V	03S7116-1	000-112-779	
	COIL コイル			
L 31	SN-5-400		000-105-220	
L 32	SN-3-205	04S4156-0	000-103-758	

UNIT RDP-098/099 | REF. DWG. C3359-K02-C | BLOCK NO. 1B2 | 4

SYMBOL 記号	TYPE 型名	SPECIFICATIONS 規格	CODE NO. コード番号	REMARKS 備考
	COIL コイル			
L 33	SN-3-205	04S4156-0	000-103-758	
	TRANSISTOR トランジスター			
Q 1	2SB941AP		000-121-302	
Q 2	2SK1432		000-124-178	
Q 31	2SB941AP		000-121-302	
	RESISTOR テイコウ			
R 2	ERG-1SJW150E	F7.5-B	000-125-156	
R 3	ERD-25PJ102	0.25W 1K	000-330-357	
R 32	ERX-1SJWR33E	1W 0.33	000-127-620	
R 33	ERX-1SJWR47E	1W 0.47	000-127-621	
R 34	ERD-25PJ270	0.25W 27	000-330-319	
R 35	ERD-25PJ102	0.25W 1K	000-330-357	
R 36	ERD-25PJ102	0.25W 1K	000-330-357	
R 37	ERG-1SJW331E	1W 330	000-125-737	
R 38	ERD-25PJ102	0.25W 1K	000-330-357	
R 39	ERD-25PJ561	0.25W 560	000-330-351	
R 40	ERD-25PJ561	0.25W 560	000-330-351	
	TRANSFORMER トランス			
T 1	RT-9078-0	03S9078-0	000-125-743	
	TEST POINT テストポイント			
TP 1	B3P-SHF-1AA-K	3P	000-100-572	
TP 2	LC-2-S-YELLOW		000-537-970	
	INTEGRATED CIRCUIT シュウセキカイロ			
U 1	RC-7105	03S7105-0	000-112-783	
U 2	RC6219	03S6219	000-104-530	
U 3	RC-7106	03S7106-0	000-112-784	
U 4	TLP521-1Y	PHOTO COUPLER	000-135-834	
U 5	TLP521-1Y	PHOTO COUPLER	000-135-834	
U 6	TLP521-1Y	PHOTO COUPLER	000-135-834	
	POTENTIOMETER ポテンショメーター			
VR 1	EVM-MWGA01B52	00S0119-1	000-103-646	

UNIT RDP-098/099 | REF. DWG. C3360-K01-A | BLOCK NO. 1B3 | 5

SYMBOL 記号	TYPE 型名	SPECIFICATIONS 規格	CODE NO. コード番号	REMARKS 備考
	PRINTED CIRCUIT BOARD プリントキバン			
	PTU-9048	M1731/51/61	008-428-850	
	CAPACITOR コンデンサー			
C 1	ECQ-V1J105JZW	W5.0	000-114-301	
C 2	ECQ-V1J105JZW	W5.0	000-114-301	
C 3	ECQ-V1J105JZW	W5.0	000-114-301	
C 4	ECE-A1HFS471	470UF 50V	000-110-152	
C 5	ECE-A1HFS471	470UF 50V	000-110-152	
C 6	ECQ-M4472KZW	4700PF 400V	000-113-555	
C 7	ECQ-M4472KZW	4700PF 400V	000-113-555	
C 8	ECE-A1CU330E	33UF 16V	000-201-674	
C 9	ECE-A1CU220E	22UF 16V	000-201-806	
C 10	ECE-A1CU101E	100UF 16V	000-206-112	
C 11	ECE-A1CU100E	10UF 16V	000-201-672	
C 12	ECQ-V1H154JZW	0.15UF 50V	000-106-788	
C 13	ECQ-M1H103KVW	0.01UF 50V	000-260-416	
C 14	ECE-A1CU470E	47UF 16V	000-206-104	
C 31	ECEA1CFE122	1200UF 16V	000-116-460	
C 32	ECE-A1CFE332	3300UF 16V	000-118-923	
C 33	ECE-A1CU100E	10UF 16V	000-201-672	
C 34	ECEA1CFE122	1200UF 16V	000-116-460	
C 35	RPE132CH471J50	470PF 50V	000-104-903	
C 36	ECE-A1AFE471E		000-125-733	
C 37	ECE-A1HU470E	W5.0 47MF 50V	000-201-835	
	DIODE ダイオード			
CR 31	CTG-24R		000-110-155	
CR 32	MA654		000-116-423	
CR 33	RD6.2EB1	ZENER	000-134-833	
CR 34	RD5.1EB1	ZENER 5V	000-134-838	
CR 35	MA165		000-112-763	
CR 36	SB20-03B		000-125-744	
CR 37	RG2Z-LF-B2	FS1550	000-118-509	
CR 38	MA165		000-112-763	
	FILTER フイルター			
FL 1	FBA03HA450KD-00		000-115-552	
FL 2	FBA03HA450KD-00		000-115-552	
	JACK ジャック			
J 1	B8P-VH	8P	000-505-826	
J 2	B11B-EH-A		000-125-745	
J 1301	B4P-VH	4P	000-505-822	
	RELAY リレー			
K 1	G6EK-134C-DC9V	03S7116-1	000-112-779	

UNIT RDP-098/099 | REF. DWG. C3360-K01-A | BLOCK NO. 1B3 | 6

SYMBOL 記号	TYPE 型名	SPECIFICATIONS 規格	CODE NO. コード番号	REMARKS 備考
	RELAY リレー			
K 2	DK1A-5V	AW3019	000-118-282	
	COIL コイル			
L 31	SHP-032		000-116-128	
L 32	SHP-052		000-125-746	
L 33	SN-3-205	04S4156-0	000-103-758	
	TRANSISTOR トランジスター			
Q 1	2SB941AP		000-121-302	
Q 2	2SK736(1)		000-111-664	
Q 3	2SK736(1)		000-111-664	
Q 31	2SC945		000-124-420	
Q 32	2SA715C		000-117-430	
Q 33	2SA1015-O		000-118-044	
	RESISTOR テイコウ			
R 1	ERG-2SJW150E		000-125-738	
R 2	ERG-2SJW150E		000-125-738	
R 3	WOR K-5.0A-20ミリオーム J	03S9085-0	000-125-748	
R 4	WOR K-5.0A-20ミリオーム J	03S9085-0	000-125-748	
R 5	ERD-16TJ102	0.16W 1K	000-330-801	
R 6	ERD-16TJ223	0.16W 22K	000-330-810	
R 31	ERG-1SJW331E	1W 330	000-125-737	
R 32	ERD-16TJ101	0.16W 100	000-329-013	
R 33	ERD-16TJ102	0.16W 1K	000-330-801	
R 34	ERD-16TJ152	0.16W 1.5K	000-329-039	
R 35	ERD-16TJ821	0.16W 820	000-329-034	
R 36	ERX-1SJWR22E		000-125-735	
R 37	ERG-2SJW181E		000-125-739	
R 38	ERD-16TJ101	0.16W 100	000-329-013	
R 39	ERD-16TJ272	0.16W 2.7K	000-329-043	
R 40	ERD-16TJ102	0.16W 1K	000-330-801	
R 41	ERD-25PJ103	0.25W 10K	000-330-381	
R 42	ERD-16TJ102	0.16W 1K	000-330-801	
R 43	ERD-16TJ222	0.16W 2.2K	000-330-809	
	TRANSFORMER トランス			
T 1	RT-9081	03S9081-0	000-125-749	
T 2	RT-9082	03S9082-0	000-125-751	
	TEST POINT テストポイント			
TP 1	B3P-SHF-1AA-K	3P	000-100-572	
TP 2	LC-2-S-YELLOW		000-537-970	
TP 3	LC-2-S-YELLOW		000-537-970	
	INTEGRATED CIRCUIT シュウセキカイロ			
U 1	RC-7105	03S7105-0	000-112-783	

UNIT RDP-098/099 | REF. DWG. C3360-K01-A | BLOCK NO. 1B3 | 7

SYMBOL 記号		TYPE 型名	SPECIFICATIONS 規格	CODE NO. コード番号	REMARKS 備考
		INTEGRATED CIRCUIT	シュウセキカイロ		
U	2	RC6219	03S6219	000-104-530	
U	3	RC6220-2	03S6220-12	000-104-531	
U	4	RC-9083	03S9083-0	000-125-752	
U	5	TLP521-1Y	PHOTO COUPLER	000-135-834	
U	6	MC34063P1		000-113-561	
U	7	TLP521-1Y	PHOTO COUPLER	000-135-834	
U	8	TLP521-1Y	PHOTO COUPLER	000-135-834	
		POTENTIOMETER	ポテンショメーター		
VR	1	EVM-MWGA01B52	00S0119-1	000-103-646	
VR	2	EVM-MWGA01B52	00S0119-1	000-103-646	
VR	3	EVM-MCGA01B54	50K	000-103-590	

UNIT RDP-098/099 | REF. DWG. C3359-K03-A | BLOCK NO. 1B5 | 9

SYMBOL 記号		TYPE 型名	SPECIFICATIONS 規格	CODE NO. コード番号	REMARKS 備考
		PRINTED CIRCUIT BOARD	プリントキバン		
		PNL-9043	M1721/31/51/61	008-428-780	
		CAPACITOR	コンデンサー		
C	1	ECE-V1CV470SP	U6.6-T	000-122-496	
C	2	ECU-V1H104ZFM Q3.2-T	S3660チュウシ 91/10	000-115-311	
C	3	ECU-V1H104ZFM Q3.2-T	S3660チュウシ 91/10	000-115-311	
C	4	ECU-V1H104ZFM Q3.2-T	S3660チュウシ 91/10	000-115-311	
		DIODE	ダイオード		
CR	1	MU17-5101		000-125-777	
CR	2	PY1101W-TR		000-125-778	
CR	3	PY1101W-TR		000-125-778	
CR	4	PY1101W-TR		000-125-778	
CR	5	PY1101W-TR		000-125-778	
CR	6	PY1101W-TR		000-125-778	
CR	7	PY1101W-TR		000-125-778	
CR	8	PY1101W-TR		000-125-778	
CR	9	PY1101W-TR		000-125-778	
CR	10	PY1101W-TR		000-125-778	
CR	11	PY1101W-TR		000-125-778	
CR	12	PY1101W-TR		000-125-778	
CR	13	PY1101W-TR		000-125-778	
		LOUDSPEAKER	スピーカー		
LS	1	PKM24-4A0		000-105-845	
		PLUG	プラグ		
P	21	JMI6LS-04BAT		000-125-781	
P	22	JMI6LS-04BAT		000-125-781	
P	23	JMI6LS-05BAT		000-125-814	
		TRANSISTOR	トランジスター		
Q	1	2SC3938R-TX		000-125-762	
		RESISTOR	テイコウ		
R	1	ERJ-6GMYJ562V	Q2.0-T	000-118-438	
R	2	ERJ-6GMYJ102V	Q2.0-T	000-118-434	
R	3	ERJ-6GMYJ152V	Q2.0-T	000-119-361	
R	4	ERJ-6GMYJ122V	Q2.0-T	000-118-426	
R	5	ERJ-6GMYJ822V	Q2.0-T	000-118-433	
R	6	ERJ-6GMYJ822V	Q2.0-T	000-118-433	
R	7	ERJ-6GMYJ123V	Q2.0-T	000-118-422	
R	8	ERJ-6GMYJ102V	Q2.0-T	000-118-434	
R	9	ERJ-6GMYJ102V	Q2.0-T	000-118-434	
R	10	ERJ-6GMYJ102V	Q2.0-T	000-118-434	
R	11	ERJ-6GMYJ102V	Q2.0-T	000-118-434	

UNIT RDP-098/099 | REF. DWG. C3359-K02-C C3360-K01-B | BLOCK NO. 1B4 | 8

SYMBOL 記号		TYPE 型名	SPECIFICATIONS 規格	CODE NO. コード番号	REMARKS 備考
		PRINTED CIRCUIT BOARD	プリントキバン		
		FIL-9049	M1721/31/51/61	008-428-860	
		CAPACITOR	コンデンサー		
C	1	ECE-A1HN470S	47UF 50V	000-201-637	
C	2	ECQ-V1J105JMW	W5.0	000-128-210	
C	3	ECE-A1HU221	220UF 50V	000-201-746	
		DIODE	ダイオード		
CR	1	U06C		000-135-901	
		COIL	コイル		
L	1	SC-05-10J	03S6316-0	000-104-536	
		PLUG	プラグ		
P 1301		VHR-4N		000-505-887	
		BVH-21T-P1.1	VH CONTACT	000-100-049 4 PCS	

UNIT RDP-098/099 | REF. DWG. C3359-K03-A | BLOCK NO. 1B5 | 10

SYMBOL 記号		TYPE 型名	SPECIFICATIONS 規格	CODE NO. コード番号	REMARKS 備考
		RESISTOR	テイコウ		
R	12	ERJ-6GMYJ102V	Q2.0-T	000-118-434	
R	13	ERJ-6GMYJ102V	Q2.0-T	000-118-434	
R	14	ERJ-12YJ330H	Q4.5-T	000-122-421	
R	15	ERJ-12YJ150H		000-125-782	
R	16	ERJ-12YJ150H		000-125-782	
R	17	ERJ-6GMYJ102V	Q2.0-T	000-118-434	
R	18	ERJ-6GMYJ823V	Q2.0-T	000-121-890	
R	19	ERJ-6GMYJ332V	Q2.0-T	000-119-354	
		SWITCH	スイッチ		
S	1	SKHUQB	03S9091-0	000-125-812	
S	2	SKHUQB	03S9091-0	000-125-812	
S	3	SKHUQB	03S9091-0	000-125-812	
S	4	SKHUQB	03S9091-0	000-125-812	
S	5	SKHUQB	03S9091-0	000-125-812	
S	6	SKHUQB	03S9091-0	000-125-812	
S	7	SKHUQB	03S9091-0	000-125-812	
S	8	SKHUQB	03S9091-0	000-125-812	
S	9	SKHUQB	03S9091-0	000-125-812	
S	10	SKHUQB	03S9091-0	000-125-812	
S	11	SKHUQB	03S9091-0	000-125-812	
		INTEGRATED CIRCUIT	シュウセキカイロ		
U	1	TC4049BF		000-112-624	
U	2	UPC1093T-E1	Q4.5-T	000-122-532	

UNIT	RDP-098/099	REF. DWG.	C3359-K03-A	BLOCK NO.	1B6	11

SYMBOL 記号	TYPE 型名	SPECIFICATIONS 規格	CODE NO. コード番号	REMARKS 備考
	PRINTED CIRCUIT BOARD プリントキバン			
	VOL-9044	M1721/31/51/61	008-428-790	
	JACK ジャック			
J 21	JMI6LH-04BAT		000-128-442	
J 22	JMI6LH-04BAT		000-128-442	
J 23	JMI6LH-04BAT		000-128-442	
	POTENTIOMETER ポテンショメーター			
VR 601	RK0971114-5KB	03S9090-0	000-125-811	GAIN & H.M.OFF
VR 602	RK0971114-5KB	03S9090-0	000-125-811	A/C SEA & PLOT
VR 603	RK0971114-5KB	03S9090-0	000-125-811	A/C RAIN & FTC

UNIT	RDP-098/099	REF. DWG.	C3309-010-F	BLOCK NO.	1B8	13

SYMBOL 記号	TYPE 型名	SPECIFICATIONS 規格	CODE NO. コード番号	REMARKS 備考
	PRINTED CIRCUIT BOARD プリントキバン			
	A1QA9DSP45	03S7095-7	000-125-968	
	VBE2911B39N1A		000-118-290	CRT
	QSOCV0019PAZZ		000-118-294	CRT SOCKET
	DPWB-1104PAZZ	A1QA9DSP45	000-125-956	MAIN & CRT PCBS
	CAPACITOR コンデンサー			
C 507	RC-EZ0029TAZZ	22F 16V	000-120-167	
C 510	RC-EZ0061PAZZ	47F 10V	000-120-154	
C 615	RC-EZ0027PAZZ	10F 25V	000-120-161	
	DIODE ダイオード			
D 401	VHDRGP01-12/-1	A1QA99DSP45	000-120-169	
D 402	VHDRGP01-08/-1	A1QA9DSP45	000-120-173	
D 403	VHDRGP01-08/-1	A1QA9DSP45	000-120-173	
	DEFLECTION COIL ヘンコウコイル			
DY	RCILH0007PAZZ		000-120-138	
	INTEGRATED CIRCUIT シュセキカイロ			
IC 501	RH-IX0487PAZZ		000-120-264	
	COIL コイル			
L 601	RCILB0031TAZZ		000-427-235	
L 602	RCILZ3776PAZZ		000-117-944	
L 603	RCILZ3731PAZZ		000-117-943	
	TRANSISTOR トランジスター			
Q 605	2SC3174		000-117-949	
	RESISTOR テイコウ			
R 401	RVR-M0154PAZZ	VR/500KB	000-120-259	
R 508	RVR-M0159PAZZ	VR/20KB	000-120-260	
R 510	RVR-M0153PAZZ	VR/50KB	000-120-258	
R 515	RVR-M0152PAZZ	VR/300B	000-120-257	
	TRANSFORMER トランス			
T 601	RTRNF0017TAZZ		000-118-292	H-DRINE
T 602	RTRNF5021PAZZ	A1QA9DSP45	000-125-958	FBT

UNIT	RDP-098/099	REF. DWG.	C3359-K03-A	BLOCK NO.	1B7	12

SYMBOL 記号	TYPE 型名	SPECIFICATIONS 規格	CODE NO. コード番号	REMARKS 備考
	PRINTED CIRCUIT BOARD プリントキバン			
	TB-9045	M1721/31/51/61	008-428-810	
	PLUG プラグ			
P 59	FS2N76.2A6		000-125-787	
	RESISTOR テイコウ			
R 1	ERD-16TJ391	0.16W 390	000-329-027	
R 2	ERD-16TJ391	0.16W 390	000-329-027	
R 3	ERD-16TJ391	0.16W 390	000-329-027	
R 4	ERD-16TJ391	0.16W 390	000-329-027	
	INTEGRATED CIRCUIT シュウセキカイロ			
U 1	TLP1029		000-125-788	
U 2	TLP1029		000-125-788	
U 3	TLP1029		000-125-788	
U 4	TLP1029		000-125-788	

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ELECTRICAL PARTS LIST
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MODEL	MODEL 1721			
UNIT	RSB-0054 SCANNER UNIT			PAGE
REF. DWG.	C3359-K04-A	BLOCK NO.	2B1	14

SYMBOL 記号	TYPE 型名	SPECIFICATIONS 規格	CODE NO. コード番号	REMARKS 備考
	PRINTED CIRCUIT BOARD	プリントキバン		
2B01	RF CHASSIS			
2B02	MD-9052	MODULATOR	008-429-100	
2B03	RC-9052	IF IMP Amp.	000-125-914	MODULE IC
	MOTOR	モーター		
B 801	RM-9086 (BRUSHLESS)	M1720/1721	000-125-789	
	CIRCULATOR	サーキュレータ		
HY 801	FCX71	03S7406-1	000-112-821	
	PLUG	プラグ		
P 803	H3P-SHF-AA,3P	NH HOUSING	000-505-596	
	BHF-001T-0.8BS	NH CONTACT	000-505-504	3 PCS
	SWITCH	スイッチ		
S 801	NRS-101-56	03S8520-0	000-117-630	
	INTEGRATED CIRCUIT	シュウセキカイロ		
U 801	S-RX25, A	03S7407-3	000-126-172	
	ELECTRON TUBE	デンシカン		
V 801	E3554(E3561)	03S8656-1	000-119-503	SELECT ONE
	MG5353	03S8340	000-117-473	

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MODEL	MODEL 1731			
UNIT	RSB-0055 SCANNER UNIT			PAGE
REF. DWG.	C3319-K05-G	BLOCK NO.	2B1	15

SYMBOL 記号	TYPE 型名	SPECIFICATIONS 規格	CODE NO. コード番号	REMARKS 備考
	PRINTED CIRCUIT BOARD プリントキバン			
2B01	RF CHASSIS			
2B02	MD-7918C	MODULATOR	008-429-180	
2B03	IF-7758C	IF AMP	008-390-540	
	MOTOR モーター			
B 801	RM-9087 (BRUSHLESS)	M1731/1830,7010	000-125-790	
	CIRCULATOR サーキュレータ			
HY 801	FCX73	03S8016-0	000-115-547	
	PLUG プラグ			
P 613	H8P-SHF-AA,8P	NH HOUSING	000-505-601	
	BHF-001T-0.8BS	NH CONTACT	000-505-504	5 PCS
P 804	H8P-SHF-AA,8P	NH HOUSING	000-505-601	
	BHF-001T-0.8BS	NH CONTACT	000-505-504	5 PCS
P 805	H3P-SHF-AA,3P	NH HOUSING	000-505-596	
	BHF-001T-0.8BS	NH CONTACT	000-505-504	2 PCS
	SWITCH スイッチ			
S 801	NRS-101-56	03S8520-0	000-117-630	
	INTEGRATED CIRCUIT シュウセキカイロ			
U 801	RU-8015		000-115-548	
	ELECTRON TUBE デンシカン			
V 801	9M302/E3513L	03S5676-1	000-101-733	

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電気部品表

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MODEL	MODEL 1751			
UNIT	RSB-0047 SCANNER UNIT			PAGE
REF. DWG.	C3343-K01-C	BLOCK NO.	2B1	16

SYMBOL 記号	TYPE 型名	SPECIFICATIONS 規格	CODE NO. コード番号	REMARKS 備考
	PRINTED CIRCUIT BOARD	プリントキバン		
2B01	SCANNER BODY			
2B02	MD-9052	MODULATOR	008-429-110	
2B03	IF-7758C	IF AMP	008-390-540	
2B04	03P8630A	INTERFACE	008-429-210	
2B05	S-RX25/03P8658 ETC	MIC ADAPT ASSY	008-402-530	
	MOTOR	モーター		
B 801	RM-8629	03S8629	000-120-308	
	CIRCULATOR	サーキュレータ		
HY 801	FCX71	03S7406-1	000-112-821	
	JACK	ジャック		
J 806	B2P-VH-TW	03S8713	000-120-797	
	PLUG	プラグ		
P 4	H3P-SHF-AA,3P	NH HOUSING	000-505-596	
	SHF-001T-0.8BS	NH CONTACT	000-505-308	3PCS
P 611	H13P-SHF-AA,13P	NH HOUSING	000-505-610	
	SHF-001T-0.8BS	NH CONTACT	000-505-308	13PCS
	2P-SCN	SCN CONNECTOR	000-107-103	
	SCN-001T-1.0	CONTACT	000-107-776	2PCS
P 613	H8P-SHF-AA,8P	NH HOUSING	000-505-601	
	SHF-001T-0.8BS	NH CONTACT	000-505-308	8PCS
	14P-SCN	SCN CONNECTOR	000-107-081	
	SCN-001T-1.0	CONTACT	000-107-776	12PCS
P 801	VHR-9N	VH HOUSING	000-505-893	
	BVH-21T-P1.1	VH CONTACT	000-100-049	9PCS
	6P-SCN	SCN CONNECTOR	000-107-096	
	SCN-001T-1.0	CONTACT	000-107-776	5PCS
P 805	VHR-2N	VH HOUSING	000-505-885	
	BVH-21T-P1.1	VH CONTACT	000-100-049	2PCS
P 806	VHR-2N	VH HOUSING	000-505-885	
	BVH-21T-P1.1	VH CONTACT	000-100-049	2PCS
	SWITCH	スイッチ		
S 801	NRS-101-56	03S8520-0	000-117-630	
S 802	NRS-101-56	03S8520-0	000-117-630	
	2P-SCN	SCN CONNECTOR	000-107-103	
	SCN-001T-1.0	CONTACT	000-107-776	2PCS

UNIT		REF. DWG.	C3343-K01-C	BLOCK NO.	2B1	17

SYMBOL (52) 記号	TYPE 型名	SPECIFICATIONS 規格	CODE NO. コード番号	REMARKS 備考
	INTEGRATED CIRCUIT	シユウセキカイロ		
U 801	S-RX25, A	03S7407-3	000-126-172	MIC
	ELECTRON TUBE	デンシカン		
V 801	E3554(E3561)	03S8656-1	000-119-503	SELECT ONE
	MG5353	03S8340	000-117-473	

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MODEL	MODEL 1761			
UNIT	RTR-036 RF MODULE			PAGE
REF. DWG.	C3320-K01-K	BLOCK NO.	2B1	18

SYMBOL 記号	TYPE 型名	SPECIFICATIONS 規格	CODE NO. コード番号	REMARKS 備考
	PRINTED CIRCUIT BOARD	プリントキバン		
2B01	RF CHASSIS			
2B02	MD-7918C	MODULATOR	008-429-180	
2B03	IF-7758D	IF AMP	008-437-330	
2B04	MP-8070	BEARING S.G.	008-375-780	
2B05	RU-8014/MIC-8071	MIC ASSY	008-375-760	
2B06	SCANNER BODY			
	CIRCULATOR	サーキュレータ		
HY 801	RC-4356	03S5737	000-106-863	
	JACK	ジャック		
J 811	1-480707-0		000-504-258	
	350689-1		000-504-546	7PCS
J 812	1-480711-0		000-116-122	
	350689-1		000-504-546	14PCS
	PLUG	プラグ		
P 611	H13P-SHF-AA,13P	NH HOUSING	000-505-610	
	BHF-001T-0.8BS	NH CONTACT	000-505-504	10PCS
P 613	H8P-SHF-AA,8P	NH HOUSING	000-505-601	
	BHF-001T-0.8BS	NH CONTACT	000-505-504	4PCS
P 801	VHR-9N	VH HOUSING	000-505-893	
	BVH-21T-P1.1	VH CONTACT	000-100-049	7PCS
	INTEGRATED CIRCUIT	シュウセキカイロ		
U 801	RU-8014	03S8014-0	000-115-556	
	ELECTRON TUBE	デンシカン		
V 801	9M302/E3513L	03S5676-1	000-101-733	

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電気部品表
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MODEL	M1730/1731/1750/1751			
UNIT	IF-7758B, 7758C, 7758D			PAGE
REF. DWG.	C3319-K07-K	BLOCK NO.	2B3	19

SYMBOL 記号	TYPE 型名	SPECIFICATIONS 規格	CODE NO. コード番号	REMARKS 備考
	PRINTED CIRCUIT BOARD	プリントキバン		
2B03	IF-7758B	IF AMP	008-390-530	JP601:OPEN R670:8.2K R684:1.2K
	IF-7758C	IF AMP	008-390-540	JP601:SHRT R670:5.6K R684:1.5K
	IF-7758D	IF AMP	008-437-330	JP601:OPEN R670:4.7K R684:1.2K
	CAPACITOR	コンデンサー		
C 601	DD104-69B102K50V	1000PF 50V	000-253-806	
C 602	DD104-69B102K50V	1000PF 50V	000-253-806	
C 603	DD104-69B102K50V	1000PF 50V	000-253-806	
C 604	DD104-69B102K50V	1000PF 50V	000-253-806	
C 605	DD104-69B102K50V	1000PF 50V	000-253-806	
C 606	DD104-69B102K50V	1000PF 50V	000-253-806	
C 607	DD104-69B102K50V	1000PF 50V	000-253-806	
C 608	ECE-A1CKA100E	10UF	000-111-627	
C 609	ECE-A1CKA100E	10UF	000-111-627	
C 610	ECC-W1H100DC5	10PF 50V	000-256-410	
C 614	ECE-A1CKA101E	100UF	000-111-628	
C 615	ECE-A1CKA101E	100UF	000-111-628	
C 616	DD104-69B102K50V	1000PF 50V	000-253-806	
C 617	DD104-69B102K50V	1000PF 50V	000-253-806	
C 618	DD104-69B102K50V	1000PF 50V	000-253-806	
C 619	ECC-W1H120JC5	W5.0 12PF 50V	000-256-418	
C 620	DD104-69B102K50V	1000PF 50V	000-253-806	
C 621	DD104-69B102K50V	1000PF 50V	000-253-806	
C 622	DD104-69B102K50V	1000PF 50V	000-253-806	
C 623	DD104-69B102K50V	1000PF 50V	000-253-806	
C 624	DD104-69B102K50V	1000PF 50V	000-253-806	
C 625	DD104-69B102K50V	1000PF 50V	000-253-806	
C 626	DD104-69B102K50V	1000PF 50V	000-253-806	
C 627	ECC-W1H100DC5	10PF 50V	000-256-410	
C 628	ECC-W1H100DC5	10PF 50V	000-256-410	
C 629	DD104-69B102K50V	1000PF 50V	000-253-806	
C 630	ECE-A1CKA100E	10UF	000-111-627	
C 631	DD104-69B102K50V	1000PF 50V	000-253-806	
C 632	ECE-A1CKA101E	100UF	000-111-628	
C 633	ECE-A1CKA100E	10UF	000-111-627	
C 634	ECE-A1CKA100E	10UF	000-111-627	
C 640	ECC-W1H560JC5	56PF 50V	000-256-422	
C 641	ECQ-M1H182KVW	1800PF 50V	000-260-466	

UNIT IF-7758B, 7758C, 7758D | REF. DWG. C3319-K07-K | BLOCK NO. 2B3 | 20

SYMBOL 記号	TYPE 型名	SPECIFICATIONS 規格	CODE NO. コード番号	REMARKS 備考
	CAPACITOR	コンデンサー		
C 642	ECQ-M1H472KVW	4700PF, 50V	000-260-421	
C 643	ECQ-M1H562KVW	5600PF 50V	000-260-469	
C 644	RPE132F104Z50	0.1UF 50V	000-104-501	
C 645	DD104-69B102K50V	1000PF 50V	000-253-806	
C 646	ECE-A1CKA100E	10UF	000-111-627	
C 647	ECQ-M1H562KVW	5600PF 50V	000-260-469	
C 649	ECQ-M1H562KVW	5600PF 50V	000-260-469	
C 650	RPE132F104Z50	0.1UF 50V	000-104-501	
C 651	DD104-69B102K50V	1000PF 50V	000-253-806	
C 652	ECE-A1CKA100E	10UF	000-111-627	
C 654	DD104-69B102K50V	1000PF 50V	000-253-806	
C 655	ECE-A1CKA101E	100UF	000-111-628	
C 656	DD104-69B102K50V	1000PF 50V	000-253-806	
C 657	DD104-69B102K50V	1000PF 50V	000-253-806	
C 658	DD104-69B102K50V	1000PF 50V	000-253-806	
C 661	DD104-69B102K50V	1000PF 50V	000-253-806	
C 662	DD104-69B102K50V	1000PF 50V	000-253-806	
C 663	DD104-69B102K50V	1000PF 50V	000-253-806	
C 664	ECE-A1CKA100E	10UF	000-111-627	
C 665	ECE-A1CKA100E	10UF	000-111-627	
C 675	DD104-69B102K50V	1000PF 50V	000-253-806	
C 676	DD104-69B102K50V	1000PF 50V	000-253-806	
C 677	DD104-69B102K50V	1000PF 50V	000-253-806	
C 678	DD104-69B102K50V	1000PF 50V	000-253-806	
	DIODE	ダイオード		
CR 601	1SV80		000-115-946	
CR 602	05AZ3.9X	ZENER	000-105-636	
CR 603	MA165		000-112-763	
CR 604	MI-301		000-133-699	
CR 605	MI-301		000-133-699	
CR 606	1SS16		000-114-001	
CR 607	MA165		000-112-763	
CR 608	MA165		000-112-763	
CR 609	RD6.2EB1	ZENER	000-134-833	
CR 610	05AZ5.1X	ZENER	000-104-418	
CR 611	MI-301		000-133-699	
CR 615	MA165		000-112-763	
CR 616	MA165		000-112-763	
CR 617	MA165		000-112-763	
CR 618	MA165		000-112-763	
CR 619	05AZ5.1X	ZENER	000-104-418	
CR 625	1SV68	VARI.CAP.	000-114-120	
CR 630	RD6.2EB1	ZENER	000-134-833	
CR 631	RD39EB	ZENER	000-134-862	
	JACK	ジャック		
J 611	B13P-SHF-1AA-K	13P	000-100-597	

UNIT IF-7758B, 7758C, 7758D | REF. DWG. C3319-K07-K | BLOCK NO. 2B3 | 21

SYMBOL 記号	TYPE 型名	SPECIFICATIONS 規格	CODE NO. コード番号	REMARKS 備考
	JACK	ジャック		
J 612	B6P-SHF-1AA-K	6P	000-100-584	NOT FOR M1730/1731/1830, FR-7010D, FCR-1010
J 613	B8P-SHF-1AA-K	8P	000-100-592	
	TRANSISTOR	トランジスター		
Q 602	2SC2348		000-126-161	
Q 603	2SA1015-Y		000-118-041	
Q 604	2SA1015-Y		000-118-041	
Q 605	2SA1015-Y		000-118-041	
Q 606	2SC1815-Y		000-125-631	
Q 607	2SC1815-Y		000-125-631	
Q 610	2SC1815-Y		000-125-631	
Q 611	2SC1815-Y		000-125-631	
Q 612	2SC1815-Y		000-125-631	
Q 613	2SC1815-Y		000-125-631	
Q 614	2SC1815-Y		000-125-631	
Q 615	2SC1815-Y		000-125-631	
	RESISTOR	テイコウ		
R 601	ERD-16TJ272	0.16W 2.7K	000-329-043	
R 602	ERD-16TJ331	0.16W 330	000-329-025	
R 603	ERD-16TJ392	0.16W 3.9K	000-329-047	
R 604	ERD-16TJ472	0.16W 4.7K	000-330-812	
R 605	ERD-16TJ471	0.16W 470	000-329-029	
R 606	ERD-16TJ102	0.16W 1K	000-330-801	
R 607	ERD-16TJ680	0.16W 68	000-329-009	
R 608	ERD-16TJ680	0.16W 68	000-329-009	
R 609	ERD-16TJ100	0.16W 10	000-330-839	
R 610	ERD-16TJ100	0.16W 10	000-330-839	
R 611	ERD-16TJ271	0.16W 270	000-329-023	
R 612	ERD-16TJ472	0.16W 4.7K	000-330-812	
R 613	ERD-16TJ470	0.16W 47	000-329-005	
R 614	ERD-16TJ101	0.16W 100	000-329-013	
R 615	ERD-16TJ222	0.16W 2.2K	000-330-809	
R 616	ERD-16TJ392	0.16W 3.9K	000-329-047	
R 617	ERD-16TJ471	0.16W 470	000-329-029	
R 618	ERD-16TJ681	0.16W 680	000-330-813	
R 619	ERD-16TJ222	0.16W 2.2K	000-330-809	
R 620	ERD-16TJ101	0.16W 100	000-329-013	
R 621	ERD-16TJ102	0.16W 1K	000-330-801	
R 622	ERD-16TJ220	0.16W 22	000-330-847	
R 623	ERD-16TJ100	0.16W 10	000-330-839	
R 624	ERD-16TJ100	0.16W 10	000-330-839	
R 625	ERD-16TJ100	0.16W 10	000-330-839	
R 626	ERD-16TJ222	0.16W 2.2K	000-330-809	
R 627	ERD-16TJ181	0.16W 180	000-329-019	
R 628	ERD-16TJ470	0.16W 47	000-329-005	
R 629	ERD-16TJ102	0.16W 1K	000-330-801	

UNIT IF-7758B, 7758C, 7758D | REF. DWG. C3319-K07-K | BLOCK NO. 2B3 | 22

SYMBOL 記号	TYPE 型名	SPECIFICATIONS 規格	CODE NO. コード番号	REMARKS 備考
	RESISTOR	テイコウ		
R 630	ERD-16TJ102	0.16W 1K	000-330-801	
R 631	ERD-16TJ682	0.16W 6.8K	000-329-052	
R 632	ERD-16TJ223	0.16W 22K	000-330-810	
R 633	ERD-16TJ102	0.16W 1K	000-330-801	
R 634	ERD-16TJ272	0.16W 2.7K	000-329-043	
R 635	ERD-16TJ103	0.16W 10K	000-330-802	
R 636	ERD-16TJ561	0.16W 560	000-329-031	
R 637	ERD-16TJ822	0.16W 8.2K	000-329-054	
R 638	ERD-16TJ100	0.16W 10	000-330-839	
R 639	ERD-16TJ821	0.16W 820	000-329-034	
R 640	ERD-16TJ272	0.16W 2.7K	000-329-043	
R 641	ERD-16TJ102	0.16W 1K	000-330-801	
R 642	ERD-16TJ563	0.16W 56K	000-329-069	
R 643	ERD-16TJ273	0.16W 27K	000-330-811	
R 644	ERD-16TJ100	0.16W 10	000-330-839	
R 646	ERD-16TJ272	0.16W 2.7K	000-329-043	
R 647	ERD-16TJ102	0.16W 1K	000-330-801	
R 648	ERD-16TJ563	0.16W 56K	000-329-069	
R 650	ERD-16TJ100	0.16W 10	000-330-839	
R 651	ERD-16TJ101	0.16W 100	000-329-013	
R 652	ERD-16TJ332	0.16W 3.3K	000-329-045	
R 653	ERD-16TJ183	0.16W 18K	000-329-061	
R 654	ERD-16TJ471	0.16W 470	000-329-029	
R 655	ERD-16TJ102	0.16W 1K	000-330-801	
R 656	ERD-16TJ223	0.16W 22K	000-330-810	
R 657	ERD-16TJ681	0.16W 680	000-330-813	
R 658	ERD-16TJ562	0.16W 5.6K	000-329-050	
R 659	ERD-16TJ102	0.16W 1K	000-330-801	
R 660	ERD-16TJ101	0.16W 100	000-329-013	
R 670	ERD-16TJ822	0.16W 8.2K	000-329-054	IF-7758B
	ERD-16TJ562	0.16W 5.6K	000-329-050	IF-7758C
	ERD-16TJ472	0.16W 4.7K	000-330-812	IF-7758D
R 671	ERD-16TJ472	0.16W 4.7K	000-330-812	
R 672	ERD-16TJ103	0.16W 10K	000-330-802	
R 673	ERD-16TJ102	0.16W 1K	000-330-801	
R 674	ERD-16TJ100	0.16W 10	000-330-839	
R 675	ERD-16TJ101	0.16W 100	000-329-013	
R 677	ERD-16TJ103	0.16W 10K	000-330-802	
R 684	ERD-16TJ122	0.16W 1.2K	000-329-037	IF-7758B/D
	ERD-16TJ152	0.16W 1.5K	000-329-039	IF-7758C
R 685	ERG-1SJ390P	1W 39	000-375-391	
R 686	ERD-16TJ103	0.16W 10K	000-330-802	
	THERMISTOR	サーミスター		
RT 601	D-33A		000-180-625	
	TRANSFORMER	トランス		
T 601	RT-8062	03S8062	000-115-948	

UNIT IF-7758B, 7758C, 7758D | REF. DWG. C3319-K07-K | BLOCK NO. 2B3 | 23

SYMBOL 記号	TYPE 型名	SPECIFICATIONS 規格	CODE NO. コード番号	REMARKS 備考
	TRANSFORMER トランス			
T 602	RT-7502	03S7502	000-114-121	
T 603	RT-8164	03S8164	000-116-343	
T 604	RT-8169	03S8169-0	000-116-673	
	TEST POINT テストポイント			
TP 601	LC-2-S-YELLOW		000-537-970	
TP 602	LC-2-S-BLACK		000-537-971	
TP 603	LC-2-S-YELLOW		000-537-970	
TP 604	LC-2-S-YELLOW		000-537-970	
TP 605	LC-2-S-YELLOW		000-537-970	
	INTEGRATED CIRCUIT シュウセキカイロ			
U 601	RC-7830	03S7830	000-115-949	
U 602	M5186P		000-150-284	
U 603	RC-7831-2	03S7831-2	000-128-441	
U 604	TA78L005AP		000-163-506	
	POTENTIOMETER ポテンショメーター			
VR 601	EVM-MCGA01B53	5K	000-103-631	
VR 602	EVM-MCGA01B53	5K	000-103-631	
VR 603	EVM-MCGA01B23	2K	000-103-630	

UNIT IF-7758B, 7758C, 7758D | REF. DWG. C3343-K02-C | BLOCK NO. 2B4 | 24

SYMBOL 記号	TYPE 型名	SPECIFICATIONS 規格	CODE NO. コード番号	REMARKS 備考
	PRINTED CIRCUIT BOARD プリントキバン			
2B04	03P8630A	INTERFACE	008-429-210	
	CAPACITOR コンデンサー			
C 1	RPE132CH331J50	330PF 50V	000-105-389	
C 2	RPE132CH331J50	330PF 50V	000-105-389	
C 3	RPE132F104Z50	0.1UF 50V	000-104-501	
C 4	ECE-A1HKA100E	W5.0	000-120-323	
C 5	ECQ-M1H103KVW	0.01UF 50V	000-260-416	
C 6	ECE-A1CKA101E	100UF	000-111-628	
C 7	ECE-A1CKA101E	100UF	000-111-628	
C 8	RPE132F104Z50	0.1UF 50V	000-104-501	
C 11	RPE132F104Z50	0.1UF 50V	000-104-501	
C 12	RPE132F104Z50	0.1UF 50V	000-104-501	
C 13	DD109-69E103P50V	0.01UF 50V	000-253-801	
C 14	ECQ-V1H105JZW	1UF 50V	000-104-801	
	DIODE ダイオード			
CR 1	RD22ESB	ZENER	000-119-583	
CR 4	3BZ61(LC6-15)		000-118-510	
CR 7	3BZ61(LC6-15)		000-118-510	
CR 8	1SS133		000-103-097	
	JACK ジャック			
J 1	B10P-VH	10P	000-505-828	
J 2	B9P-VH	9P	000-505-827	
J 3	B5P-VH	5P	000-505-823	
J 4	B3P-SHF-1AA-K	3P	000-100-572	
	TRANSISTOR トランジスター			
Q 3	2SC1815-Y		000-125-631	
Q 4	2SC1815-Y		000-125-631	
Q 5	2SK704		000-113-556	
	OSH-1025-SPL		000-112-808	HEAT SINK
Q 7	2SC1959-O		000-116-323	
Q 8	2SC1959-O		000-116-323	
Q 9	2SC945		000-124-420	
Q 10	2SA733		000-117-445	
	RESISTOR テイコウ			
R 1	ERD-16TJ102	0.16W 1K	000-330-801	
R 2	ERD-16TJ473	0.16W 47K	000-330-814	
R 3	ERD-16TJ103	0.16W 10K	000-330-802	
R 5	ERD-16TJ103	0.16W 10K	000-330-802	
R 7	ERD-16TJ103	0.16W 10K	000-330-802	
R 8	ERD-16TJ223	0.16W 22K	000-330-810	
R 9	ERD-16TJ102	0.16W 1K	000-330-801	
R 11	ERD-16TJ683	0.16W 68K	000-329-071	

UNIT IF-7758B, 7758C, 7758D | REF. DWG. C3343-K02-C | BLOCK NO. 2B4 | 25

SYMBOL 記号	TYPE 型名	SPECIFICATIONS 規格	CODE NO. コード番号	REMARKS 備考
	RESISTOR テイコウ			
R 12	ERD-16TJ103	0.16W 10K	000-330-802	
R 14	ERD-16TJ473	0.16W 47K	000-330-814	
R 15	ERD-16TJ223	0.16W 22K	000-330-810	
R 16	ERD-16TJ103	0.16W 10K	000-330-802	
R 18	ERD-16TJ223	0.16W 22K	000-330-810	
R 19	ERD-16TJ103	0.16W 10K	000-330-802	
R 20	ERD-16TJ103	0.16W 10K	000-330-802	
R 21	ERD-16TJ103	0.16W 10K	000-330-802	
R 26	ERD-16TJ223	0.16W 22K	000-330-810	
R 27	ERD-16TJ272	0.16W 2.7K	000-329-043	
R 28	BPR28F0.05K	2W 0.05	000-115-551	
R 29	ERD-16TJ101	0.16W 100	000-329-013	
R 30	ERD-16TJ331	0.16W 330	000-329-025	
R 31	ERD-16TJ103	0.16W 10K	000-330-802	
R 32	ERD-16TJ103	0.16W 10K	000-330-802	
R 33	ERD-16TJ103	0.16W 10K	000-330-802	
R 34	ERD-16TJ472	0.16W 4.7K	000-330-812	
R 35	ERG-1SJ470P	1W 47	000-375-392	
R 36	ERD-16TJ102	0.16W 1K	000-330-801	
R 41	ERD-16TJ104	0.16W 100K	000-330-803	
	SWITCH スイッチ			
S 1	G-15AP		000-112-682	
S 802	NRS-101-56	03S8520-0	000-117-630	
	INTEGRATED CIRCUIT シュウセキカイロ			
U 2	TC4027BP(NEW)		000-109-201	
U 3	TC4001BP		000-163-240	
U 4	TC4011BP		000-163-245	

UNIT IF-7758B, 7758C, 7758D | REF. DWG. C3327-K02-F | BLOCK NO. 2B4 | 26

SYMBOL 記号	TYPE 型名	SPECIFICATIONS 規格	CODE NO. コード番号	REMARKS 備考
	PRINTED CIRCUIT BOARD プリントキバン			
2B04	MP-8070	BEARING S.G.	008-375-780	
	CAPACITOR コンデンサー			
C 701	DD109-69E103P50V	0.01UF 50V	000-253-801	
C 702	ECE-A1CU101E	100UF 16V	000-206-112	
C 703	ECE-A1CU222	2200UF 16V	000-201-715	
	DIODE ダイオード			
CR 701	3BZ61		000-129-920	
CR 702	1S2095A		000-113-046	
CR 703	RD-9.1EB1	ZENER	000-134-835	
CR 704	BCR16DM-12L		000-117-030	
CR 705	3BZ61		000-129-920	
CR 706	1S2095A		000-113-046	
	JACK ジャック			
J 701	B7P-VH	7P	000-505-825	
J 702	B6P-VH	6P	000-505-824	
J 703	B3P-SHF-1AA-K	3P	000-100-572	
J 704	B4P-SHF-1AA-K	4P	000-100-573	
	TRANSISTOR トランジスター			
Q 701	2SC1959-O		000-116-323	
Q 702	2SC1959-O		000-116-323	
Q 703	2SC945		000-124-420	
	RESISTOR テイコウ			
R 701	ERG-1SJ470P	1W 47	000-375-392	
R 702	ERD-25PJ102	0.25W 1K	000-330-357	
R 703	ERD-25PJ102	0.25W 1K	000-330-357	
R 704	ERD-25PJ102	0.25W 1K	000-330-357	
R 705	ERD-25PJ331	0.25W 330	000-330-345	
R 706	ERD-25PJ332	0.25W 3.3K	000-330-369	
R 707	ERD-25PJ102	0.25W 1K	000-330-357	
R 709	ERG-3SJ561P	3W 560	000-375-536	
R 710	ERF-5ZXJ100	5W 10	000-114-280	
R 711	ERG-1SJ222P	1W 2.2K	000-375-413	

UNIT	IF-7758B, 7758C, 7758D	REF. DWG.	C3343-K01-C	BLOCK NO.	2B5	27

SYMBOL 記号	TYPE 型名	SPECIFICATIONS 規格	CODE NO. コード番号	REMARKS 備考
	PRINTED CIRCUIT BOARD プリントキバン			
2B05	S-RX25/03P8658 ETC	MIC ADAPT ASSY	008-402-530	
	PLUG プラグ			
P 612	H6P-SHF-AA	NH HOUSING	000-505-599	
	SHF-001T-0.8BS	NH CONTACT	000-505-308	
	SIN-01T-1.2		000-505-896	

UNIT	IF-7758B, 7758C, 7758D	REF. DWG.	C3320-K01-K	BLOCK NO.	2B6	29

SYMBOL 記号	TYPE 型名	SPECIFICATIONS 規格	CODE NO. コード番号	REMARKS 備考
	PRINTED CIRCUIT BOARD プリントキバン			
2B06	SCANNER BODY			
	MOTOR モーター			
B 801	RM-8025	03S8025-0	000-116-125	
	PLUG プラグ			
P 701	VHR-7N		000-505-891	
	BVH-21T-P1.1	VH CONTACT	000-100-049	6PCS
P 703	H3P-SHF-AA,3P	NH HOUSING	000-505-596	
	BHF-001T-0.8BS	NH CONTACT	000-505-504	2PCS
P 811	1-480706-0		000-504-268	
	350690-1		000-504-549	7PCS
P 812	1-480710-0		000-108-835	
	350690-1		000-504-549	13PCS
	SWITCH スイッチ			
S 801	RS-1,NO	03S8621-0	000-118-533	
	TERMINAL BOARD タンシバン			
TB 1	LK-10P (1 TO 10)		000-533-510	
	LK-10P (11 TO 20)		000-533-511	

- END -

UNIT	IF-7758B, 7758C, 7758D	REF. DWG.	C3320-K01-K	BLOCK NO.	2B5	28

SYMBOL 記号	TYPE 型名	SPECIFICATIONS 規格	CODE NO. コード番号	REMARKS 備考
	PRINTED CIRCUIT BOARD プリントキバン			
2B05	RU-8014/MIC-8071	MIC ASSY	008-375-760	
	PLUG プラグ			
P 612	H6P-SHF-AA	NH HOUSING	000-505-599	
	BHF-001T-0.8BS	NH CONTACT	000-505-504	5 PCS

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MECHANICAL PARTS LIST

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MODEL	MODEL 1721	
UNIT	RSB-0054 SCANNER	PAGE
REF. DWG.	C3359-E01-A	M- 1

SYMBOL	PARTS NAME	TYPE/DWG. NO	CODE NO.	REMARKS
1	FIXING BOLT	03-014-3202-1	100-087-081	4PCS.
2	PACKING WASHER	03-014-3203-0	100-087-090	4PCS.
3	RADOME BASE	03-014-3201-0	100-087-070	
4	RUBBER PACKING	03-014-3204-0	100-087-100	
5	MOUNTING BASE PACKING	03-014-3312-0	100-087-210	4PCS.
6	SPEED NUT	NO.38745 Ø4.5	000-801-598	4PCS.
7	MOUNTING BASE	03-014-3301-1	100-087-111	
8	TURN WAVEGUIDE	03-014-3302-1	100-087-121	
10	CORNER WAVEGUIDE	03-014-3311-1	100-087-201	2PCS.
12	BEARING	6005ZZPS2S	000-801-541	2PCS.
13	BUSH	03-014-3321-0	100-095-980	
14	BEARING RETAINER	03-014-3304-1	100-087-141	2PCS.
15	ANTENNA BUSH	03-014-4102-1	100-087-241	
16	INNER FEED WAVEGUIDE	03-014-3305-1	100-087-151	
17	SHORT PLATE	03-014-3306-1	100-087-161	
19	RF CHASSIS COVER	03-022-5101-1	100-087-251	
20	PROBE	03-014-4111-0	100-096-000	
21	REFLECTOR	03-014-3112-0	100-106-860	
22	PCB MOUNTING PLATE	03-014-4101-1	100-087-231	
23	RAC NUT	RAC-M5C25	000-801-540	4PCS.
24	UPPER RADOME	03-014-3101-0	100-087-050	
25	EMBLEM	03-014-3111-1	100-087-061	2PCS.
26	PLATE RETAINER	03-014-4103-0	100-091-730	
27	IDDLE PULLEY	03-014-3307-1	100-087-171	
28	SYNCHRONIZED BELT	170TN15-3.0K	000-801-542	
29	DRIVE PULLEY	03-014-3309-1	100-087-191	
32	AXIS	03-014-3325-0	100-095-990	
33	ADAPTOR	03-014-3303-1	100-087-131	
35	SW MOUNTING PLATE	03-022-5102-2	100-087-262	
36	AMP LID	03-022-5113-0	100-165-930	
39	AMP CASE	03-022-5111-2	100-087-272	
42	CABLE CLAMP	03-014-3331-1	100-087-221	
43	CABLE GLAND (SC-LOCK)	E3B10053	000-126-861	1SET
44	VENT TUBE	03-003-3001-0	300-330-010	

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MECHANICAL PARTS LIST

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MODEL	MODEL 1730/1731/1830, FR-7010D, FCR-1010	
UNIT	RSB-0034, RTR-020 SCANNER RSB-0055, RTR-034 UNIT	PAGE
REF. DWG.	C3319-E02-D	M-2

SYMBOL	PARTS NAME	TYPE/DWG. NO	CODE NO.	REMARKS
101	FIXING BOLT	03-014-3202-1	100-087-081	4PCS
102	PACKING WASHER	03-014-3203-0	100-087-090	4PCS
103	RADOME BASE	03-020-3201-0	100-102-410	
104	MOUNTING BASE PACKING	03-020-3333-0	100-102-510	4PCS
105	SPEED NUT	NO.38745 04.5	000-801-598	4PCS
106	PACKING FOR RADOME	03-010-3204-2	100-030-232	
107	MOUNTING BASE	03-020-3301-0	100-102-430	
108	DOOR KNOB	03-020-3303-0	100-102-450	
109	AMP CASE	03-027-5201-0	100-102-630	
110	AMP LID	03-027-5202-0	100-102-640	
111	INNER FEED WAVEGUIDE	03-020-3302-0	100-102-440	
112	BUSH	03-020-3306-0	100-108-540	SELECT ONE
	BUSH	03-009-3321-0	300-933-210	
	BUSH	03-020-3307-0	100-108-550	
113	BEARING RETAINER	03-020-3322-0	100-102-480	
114	IDLE GEAR	03-020-3321-0	100-102-660	
115	CHOKE	03-017-4107-0	100-102-590	
116	PLATE	03-008-4024-2	300-840-242	3PCS
117	LATTICE	03-017-4104-0	100-102-560	
118	SLOTTED WG (1)	03-017-4101-0	100-102-530	
119	SLOTTED WG (2)	03-017-4102-0	100-102-540	
120	SHORT END	03-017-4105-1	100-102-571	
121	RAC NUT	RAC-M5C25	000-801-540	4PCS
122	UPPER RADOME	03-020-3101-0	100-102-390	
123	EMBLEM	03-020-3111-0	100-102-400	2PCS
124	HORN RETAINER	03-017-4109-0	100-102-600	
125	HORN	03-017-4103-0	100-102-550	
126	SHORT END	03-017-4105-1	100-102-571	
127	WG RETAINER	03-017-4106-0	100-102-580	2PCS
128	BEARING COLLAR	03-020-3304-0	100-102-460	
129	BEARING	6005ZZPS2S	000-801-541	2PCS
130	BEARING RETAINER	03-020-3322-0	100-102-480	
131	AXIS	03-020-3305-0	100-102-470	
132	SW MOUNTING PLATE	03-020-3331-2	100-102-492	
133	RF CHASSIS COVER	03-027-5102-0	100-102-620	
134	CLAMPING PLATE	03-020-3332-0	100-102-500	
135	GASKET	03-009-3215-0	300-932-150	2PCS
136	RF CHASSIS	03-027-5101-0	100-102-610	
137	VENT TUBE	03-003-3001-0	300-330-010	
138	WATERPROOF SPONGE	03-020-3202-0	100-102-420	
139	GASKET PACKING	03-020-3334-0	100-102-520	

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MECHANICAL PARTS LIST

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MODEL	MODEL1750/1751	
UNIT	RSB-0047 SCANNER	PAGE
REF. DWG.	E3343-E01-B	M-3

SYMBOL	PARTS NAME	TYPE/DWG. NO	CODE NO.	REMARKS
101A	ANTENNA RADIATOR ASSEMBLY	XN065AF	008-390-220	W/NO.128
102	FIXING BOLT	03-024-3212-0	100-122-930	4 PCS
103	PACKING WASHER	03-024-3213-0	100-122-940	4 PCS
104	SCANNER LOWER HOUSING	03-024-3201-1	100-122-871	
105	PCB MOUNT (2)	03-024-3207-0	100-134-770	
106	WATERPROOF PACKING	03-024-3211-0	100-122-920	
107	GASKET	03-024-3204-1	100-122-901	
108	NON-SLIP WASHER	TM-147-4	000-801-661	4 PCS
109	FIXING PLATE	03-024-3205-1	100-122-911	
110	PCB MOUNT (1)	03-024-3206-0	100-134-760	
111	CIRCULATOR MOUNT	03-024-3202-1	100-122-881	
112	POSITION FIXTURE	03-024-3203-1	100-122-891	
113	AMP COVER	03-024-3232-1	100-122-961	
114	NUT PLATE	03-024-3215-0	100-134-810	
115	MIC COVER	03-024-3233-0	100-134-830	
116	INTERNAL FEED MOUNT	03-024-3124-1	100-122-811	
117	NUT FOR BEARING	AN-08	000-802-335	
118	WASHER FOR BEARING	AW-08	000-802-336	
119	DRIVEN GEAR	03-024-3123-1	100-122-801	
120	MOTOR MOUNTING PLATE	03-024-3131-1	100-122-841	
121	MOTOR FIXING PLATE GUIDE	03-001-3291-0	300-132-910	
122	MAGNET	RP-1757 MS4X9X15	000-499-055	FOR S802
123	SCANNER UPPER HOUSING	03-024-3101-1	100-122-741	
124	V-RING	VR-70A	000-802-009	
125	PARALLEL KEY	03-024-3122-0	100-122-790	
126	WASHER	03-024-3112-0	100-122-770	
127	RADIATOR BRACKET	03-024-3111-1	100-122-761	
128	FURUNO STICKER	03-019-4135-0	100-123-090	
129	HINGE RETAINER	03-024-3142-0	100-134-750	
130	REED SWITCH MOUNT	03-024-3141-1	100-122-861	
131	BEARING	6908ZZ	000-802-334	2 PCS
132	BEARING RETAINER (1)	03-024-3102-1	100-122-751	
133	DRIVEN GEAR MOUNT	03-024-3121-1	100-122-781	
134	INTERNAL CONDUCTOR	03-024-3113-0	100-134-900	}
	INTERNAL CONDUCTOR	03-024-3114-0	100-134-910	} SELECT
	INTERNAL CONDUCTOR	03-024-3115-0	100-134-920	}
135	SLEEVE	03-024-3127-0	100-134-740	
136	BUSH	03-024-3117-0	100-134-870	}
	BUSH	03-024-3118-0	100-134-880	} SELECT
	BUSH	03-024-3119-0	100-134-890	}
137	INTERNAL FEED WG	03-024-3125-1	100-122-821	
138	BEARING	6808ZZ	000-801-780	
139	ROUND S-TYPE CIRCLIP	ISTW-40	000-801-781	
140	BEARING RETAINER (2)	03-024-3126-0	100-122-830	
141	MAGNET	RP-1757 MS4X9X15	000-499-055	FOR S801
142	H CORNER	03-024-3241-1	100-122-971	
143	RF COVER	03-024-3242-1	100-122-981	
144	STOPPER SCREW	03-024-3209-0	100-134-790	
145	STOPPER	03-024-3208-0	100-134-780	
146	HINGE TUBE	03-024-3216-0	100-134-820	2 PCS
147	INSULATION RUBBER	03-024-3214-0	100-134-800	

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MECHANICAL PARTS LIST

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MODEL	MODEL 1760/1761/1930, FCR-1030	
UNIT	RSB-0035 SCANNER	PAGE
REF. DWG.	C3320-E01-C	M-4

SYMBOL	PARTS NAME	TYPE/DWG. NO	CODE NO.	REMARKS
101A	ANTENNA RADIATOR ASSEMBLY	XN8 FP10B-2M	008-316-280	
102A	SCANNER BODY LESS RF	RSB-0035	008-375-790	
103	ANTICORROSIVE PACKING(A)	03-002-3223-0	100-072-540	
104	ANTICORROSIVE PACKING(B)	03-002-3224-0	100-072-550	
105	VENT TUBE	03-002-3226-0	100-087-630	
106	ANTICORROSIVE PACKING(C)	03-002-3225-0	100-072-560	4PCS
107	SCANNER LOWER	03-002-3221-6	300-232-216	
108	WASHER NUT	M10	000-863-940	4PCS
109	RF FIXING BOSS	RSV-2102-3	362-221-023	4PCS
110	NUT FOR BEARING	AN-11	000-863-600	
111	WASHER FOR BEARING	AW-11	000-864-979	
112	MOTOR FIXING PLATE	03-018-3102-0	100-104-850	
113	PACKING FOR HOUSING	03-002-3215-1	300-232-151	
114	SCANNER UPPER HOUSING	03-002-3211-2	300-232-112	
115	BEARING	6912ZZ	000-873-530	
116	V-RING	VR-95A	000-850-736	
117	PARALLEL KEY	RSV-2107	362-221-070	
118	GUIDE PLATE (1)	03-018-3001-0	100-104-820	
119	ROUND S-TYPE CIRCLIP	ISTW-40	000-801-781	
120	BEARING	6808ZZ	000-801-780	
121	INTERNAL FEED WG ASSY	03-018-3050-1	100-105-081	
122	ROUND R-TYPE CIRCLIP	IRTW-55	000-801-782	
123	O-RING	JISB2401-1A-G80	000-851-313	
124	RADIATOR BRACKET ASSY	03-013-3150-0	100-070-220	
125	HEXAGONAL HEAD BOLT	03-001-3262-2	300-132-622	4PCS
126	PACKING(2)	03-002-3214-1	300-232-141	4PCS
127	STAY	03-002-3212-0	300-232-120	
128	STAY MOUNTING PLATE	03-002-3213-0	300-232-130	
129	ROUND S-TYPE CIRCLIP	ISTW-8	000-866-662	4PCS
130	PACKING	RSV-2105-2	362-221-052	4PCS
131	BEARING	6912ZZ	000-873-530	
132	ANTENNA TURNING GEAR	RSV-2501-2	362-225-012	
133	MAGNET	RP-1757 MS4X9X15	000-499-055	
134	REED SWITCH FIXING PLATE	RSV-2106-1	362-221-061	
135	STOPPER	03-018-3101-1	100-104-841	
136	HELICAL INSERT COIL	M8X1.5D	000-867-635	4PCS
137	SLOTTED PIN	10 DIA X45 G-TYPE	000-866-390	2PCS
138	CLAMPING PLATE	03-002-3222-1	300-232-221	
139	RUBBER PACKING	JIS F8801 25A RUBBER	000-870-223	
140	FLAT WASHER	JIS F8801 A25A BRASS	000-870-205	2PCS
141	GUIDE PLATE (2)	03-018-3002-0	100-104-830	
300A	RF MODULE	RTR-021	008-375-800	M1760/M1930, FCR-1030
	RF MODULE	RTR-036	008-429-280	M1761

FURUNO

MECHANICAL PARTS LIST

1992- 4

MODEL	MODEL 1760/1761/1930/1940, FR-7040D, FCR-1030/1040
UNIT	RTR-021/022/036 RF MODULE
REF. DWG.	C3327-E01-C

SYMBOL	PARTS NAME	TYPE/DWG. NO	CODE NO.	REMARKS
300A	RF MODULE	RTR-021	008-375-800	M1930/M1760, FCR-1030
	RF MODULE	RTR-022	008-375-820	M1940,FR7040D FCR-1040
	RF MODULE	RTR-036	008-429-280	M1761
301	RF COVER	03-025-5002-1	100-104-901	
302	NUT PLATE	03-025-5006-1	100-104-941	
303	RF CHASSIS	03-025-5001-3	100-104-893	
304	WG ASSY	03-025-5050-1	100-105-041	2PCS
305	MAGNETRON MOUNTING PLATE	03-025-5004-0	100-104-920	
306	GUIDE PLATE	RRN-3005-2	341-430-052	
307	AMP LID	03-025-5011-2	100-104-982	
308	AMP CASE	03-025-5009-1	100-104-971	
309	CIRCULATOR MOUNTING PLATE	03-025-5003-0	100-104-910	
310	MIC MOUNTING PLATE	03-025-5007-0	100-104-950	
311	MIC COVER	03-025-5008-1	100-104-961	
312	HEAT SINK	03-025-5005-3	100-104-933	
313	SPACER	03-025-5015-0	100-106-500	2PCS
314	INSULATING SHEET	03-025-5014-0	100-105-010	

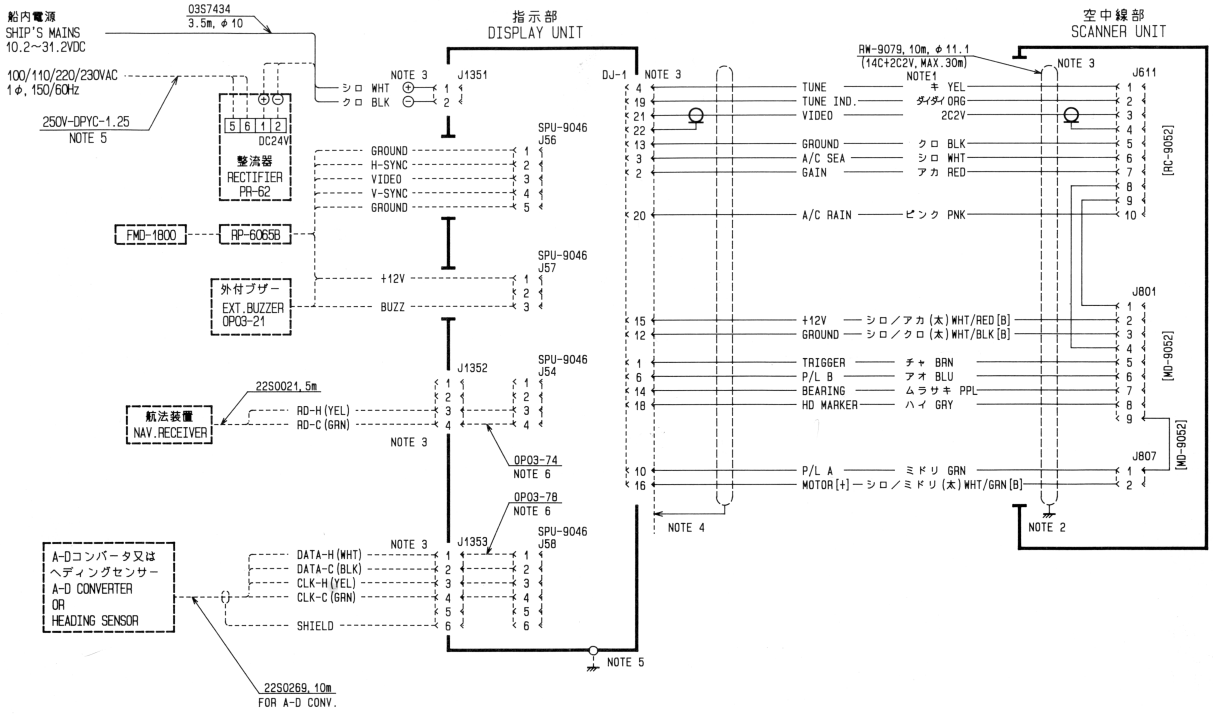
SCHEMATIC DIAGRAM

TITLE		DWG. No.	M1721	M1731	M1751	M1761	PAGE
INTERCONNECTION DIAGRAM		C3359-C01	X				S-1
		C3360-C01		X			S-2
		C3361-C01			X		S-3
		C3362-C01				X	S-4
DISPLAY UNIT		C3359-K01	X	X	X	X	S-5
POWER SUPPLY FILTER	PTU-9047 FIL-9049	C3359-K02	X				S-6
POWER SUPPLY FILTER	PTU-9048 FIL-9049	C3360-K01		X	X	X	S-7
PANEL POT. ASSY. TRACKBALL	PNL-9043 VOL-9044 TB-9055	C3359-K03	X	X	X	X	S-8
CRT	A1QA9DSP45	C3309-010	X	X	X	X	S-9
SCANNER UNIT		C3359-K04	X				S-10
		C3319-K05		X			S-11
		C3343-K01			X		S-12
		C3320-K01				X	S-13
IF AMP.	IF-7758	C3319-K07		X	X	X	S-14
INTERFACE	03P8630	C3343-K02			X		S-15
BEARING SIG.GEN.	MP-8070	C3327-K02				X	S-16

EXPLODED VIEW

TITLE	DWG. NO.	M1721	M1731	M1751	M1761	PAGE
SCANNER UNIT	C3359-E01	X				D-1
	C3319-E02		X			D-2
	C3343-E01			X		D-3
	C3320-E01				X	D-4
RF MODULE	C3327-E01				X	D-5

FURUNO



注：1. ケーブルのカラーコード。
2. 空中線部側のシールドは完全にアースすること。
3. コネクタープラグ取付済。
4. シールドはコネクターケースを通してアースされている。
5. *造船所支給。
6. オプション支給。

NOTE : 1. WIRE COLOR CODE. [B] : LARGE WIRES.
2. SHIELD SHOULD BE EFFCTIVELY GROUNDED AT SCANNER UNIT.
3. CONNECTOR PLUG FACTORY-WIRED.
4. SHIELD GROUNDED THRU CONNECTOR CASE.
5. SHIPYARD SUPPLY.
6. SUPPLIED AS STANDARD FOR OTHER THAN JAPAN.

MODEL 1721

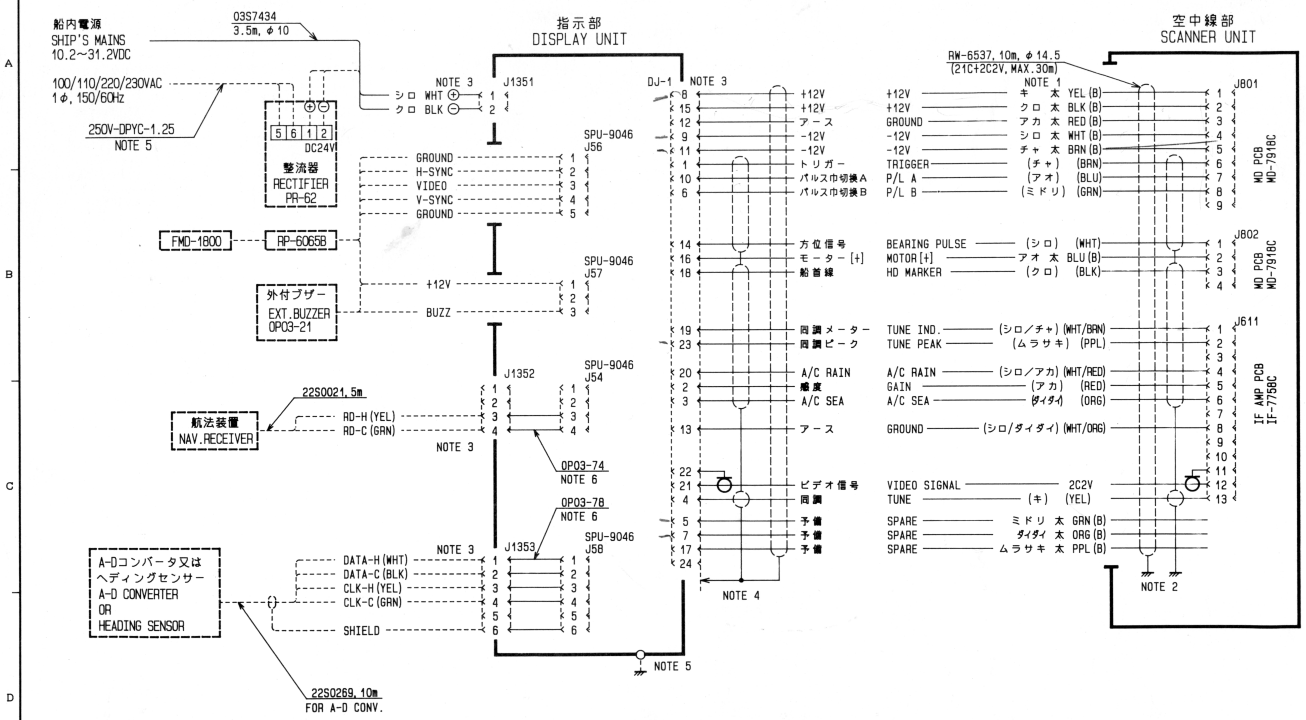
1721

承認 APPROVED	JULY・1・'92 T.NAKANO	名称 TITLE	相互結線図
検図 CHECKED	JULY・1・'92 N.SAITO		INTERCONNECTION DIAGRAM
製図 DRAWN	JULY・1・'92 Y.HATAI	図番 DWG. NO.	C3359-C01-D

FURUNO ELECTRIC CO., LTD.

S-1

FURUNO



注：1. ケーブルのカラーコードで( )は内側ケーブルを示す。
2. 空中線部側のシールドは完全にアースすること。
3. コネクタープラグ取付済。
4. シールドはコネクターケースを通してアースされている。
5. *造船所支給。
6. オプション支給。

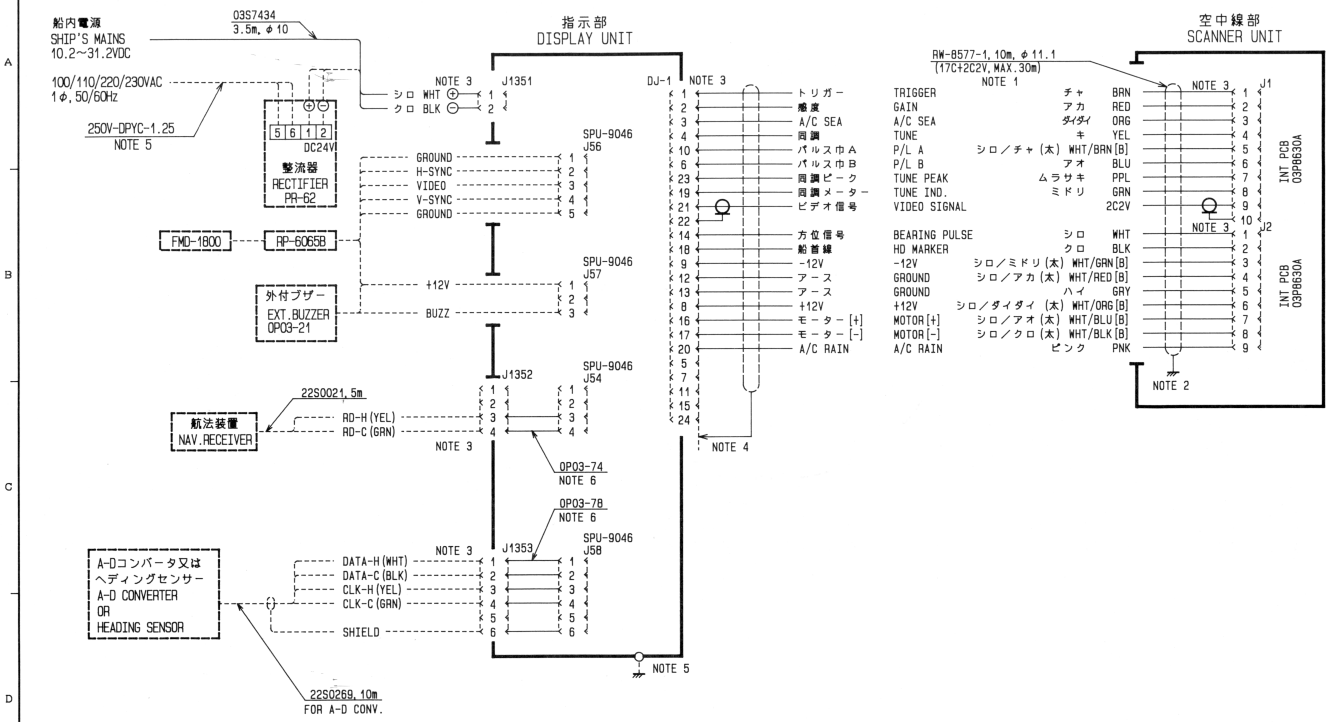
NOTE: 1. WIRE COLOR CODE. ( ) : INSIDE. (B) : LARGE WIRES.
2. SHIELD SHOULD BE EFFCTIVELY GROUNDED AT SCANNER UNIT.
3. CONNECTOR PLUG FACTORY-WIRED.
4. SHIELD GROUNDED THRU CONNECTOR CASE.
5. SHIPYARD SUPPLY.
6. SUPPLIED AS STANDARD FOR OTHER THAN JAPAN.

MODEL 1731

承認 APPROVED	JULY・1・'92 T.NAKANO	名称 TITLE	相互結線図 INTERCONNECTION DIAGRAM
検図 CHECKED	JULY・1・'92 N.SAITO		
製図 DRAWN	JULY・1・'92 Y.HATAI	図番 DWG. NO.	C3360-C01-D

FURUNO ELECTRIC CO., LTD.

FURUNO



注：1. ケーブルのカラーコード。
2. 空中線部側のシールドは完全にアースすること。
3. コネクタープラグ取付済。
4. シールドはコネクターケースを通してアースされている。
5. *造船所支給。
6. オプション支給。

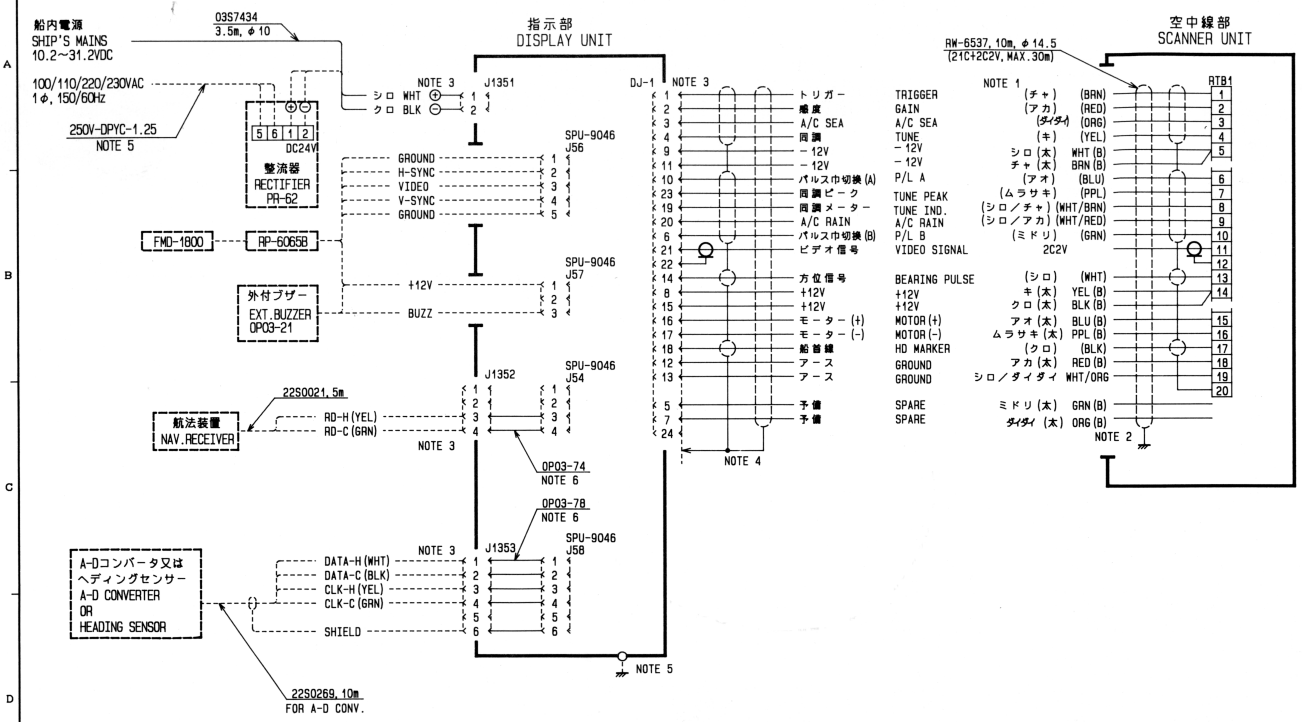
NOTE: 1. WIRE COLOR CODE. [B] : LARGE WIRES.
2. SHIELD SHOULD BE EFFCTIVELY GROUNDED AT SCANNER UNIT.
3. CONNECTOR PLUG FACTORY-WIRED.
4. SHIELD GROUNDED THRU CONNECTOR CASE.
5. SHIPYARD SUPPLY.
6. SUPPLIED AS STANDARD FOR OTHER THAN JAPAN.

MODEL 1751

承認 APPROVED	JULY・1・'92 T.NAKANO	名称 TITLE	相互結線図
検図 CHECKED	JULY・1・'92 N.SAITO		INTERCONNECTION DIAGRAM
製図 DRAWN	JULY・1・'92 Y.HATAI	図番 DWG. NO.	C3361-C01-E

FURUNO ELECTRIC CO., LTD.

FURUNO



注：1. ケーブルのカラーコードで( )は内側ケーブルを示す。
2. 空中線部側のシールドは完全にアースすること。
3. コネクタープラグ取付済。
4. シールドはコネクターケースを通してアースされている。
5. *造船所支給。
6. オプション支給。

NOTE : 1. WIRE COLOR CODE. ( ) : INSIDE. (B) : LARGE WIRES.
2. SHIELD SHOULD BE EFFCTIVELY GROUNDED AT SCANNER UNIT.
3. CONNECTOR PLUG FACTORY-WIRED.
4. SHIELD GROUNDED THRU CONNECTOR CASE.
5. SHIPYARD SUPPLY.
6. SUPPLIED AS STANDARD FOR OTHER THAN JAPAN.

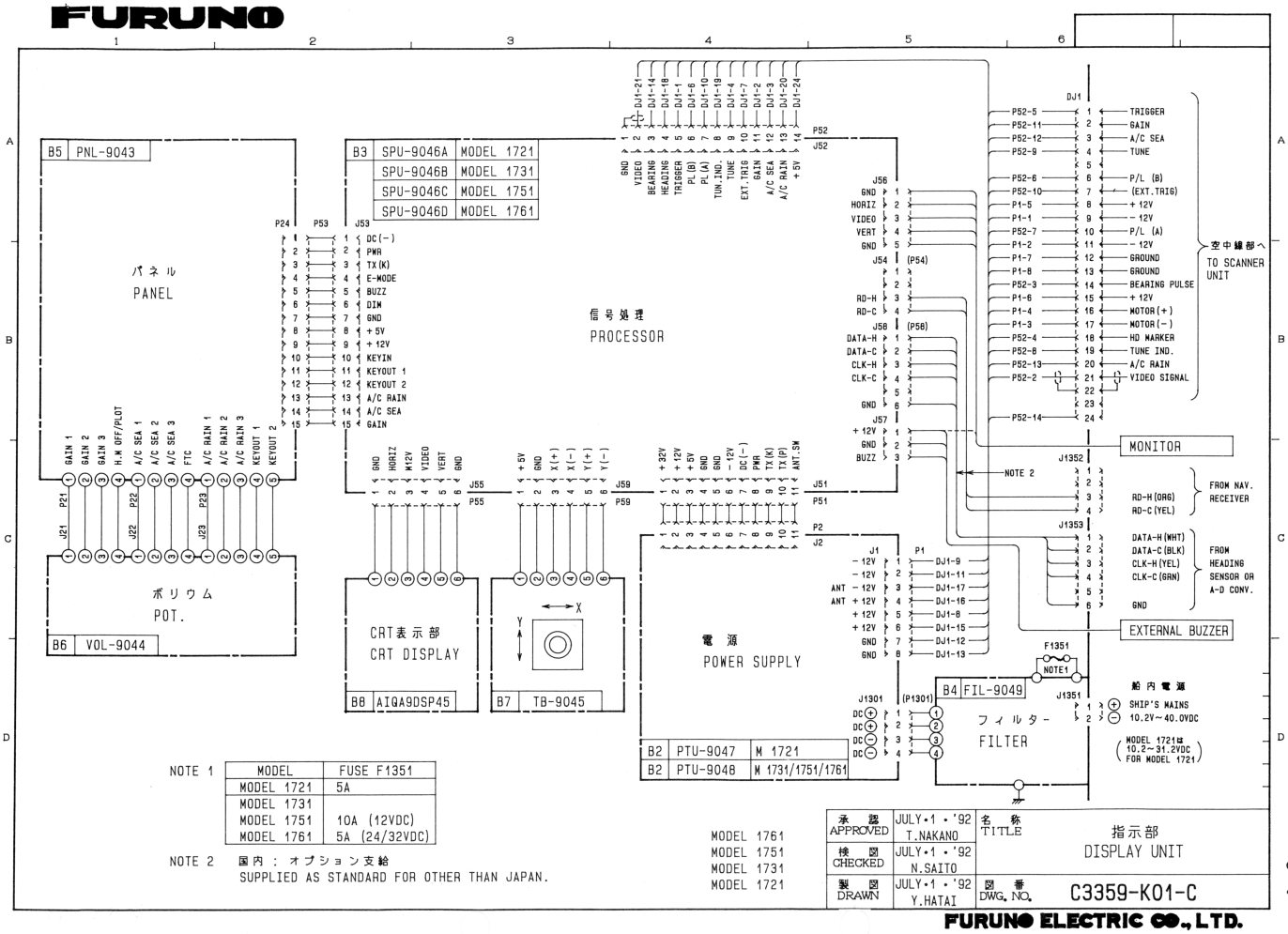
MODEL 1761

承認 APPROVED	JULY・1・'92 T.NAKANO	名称 TITLE	相互結線図 INTERCONNECTION DIAGRAM
検図 CHECKED	JULY・1・'92 N.SAITO		
製図 DRAWN	JULY・1・'92 Y.HATAI	図番 DWG. NO.	C3362-C01-D

FURUNO ELECTRIC CO., LTD.

S-4

FURUNO



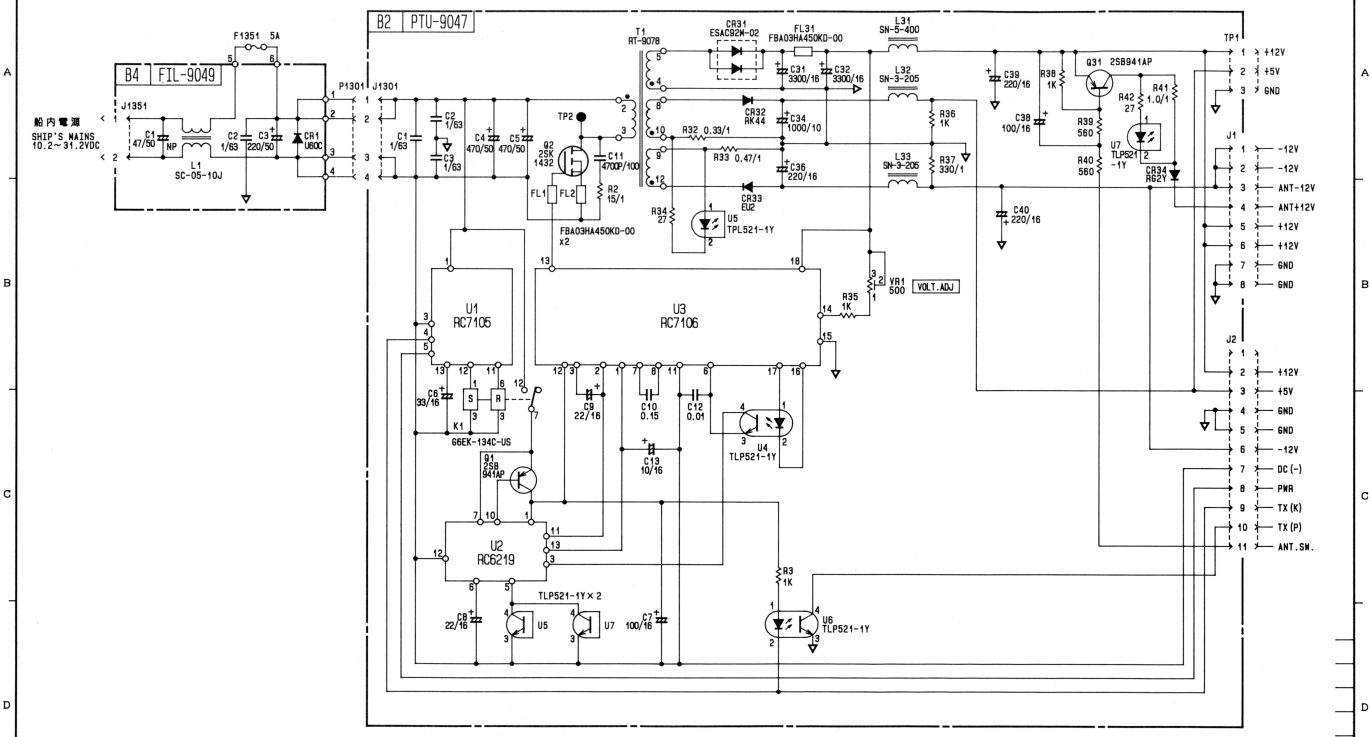
NOTE 1	MODEL	FUSE F1351
	MODEL 1721	5A
	MODEL 1731	
	MODEL 1751	10A (12VDC)
	MODEL 1761	5A (24/32VDC)

MODEL 1761
MODEL 1751
MODEL 1731
MODEL 1721

承認 APPROVED	JULY・1・'92 T.NAKANO	名称 TITLE	指示部 DISPLAY UNIT
検図 CHECKED	JULY・1・'92 N.SAITO		
製図 DRAWN	JULY・1・'92 Y.HATAI	図番 DWG. NO.	C3359-K01-C

FURUNO ELECTRIC CO., LTD.

FURUNO



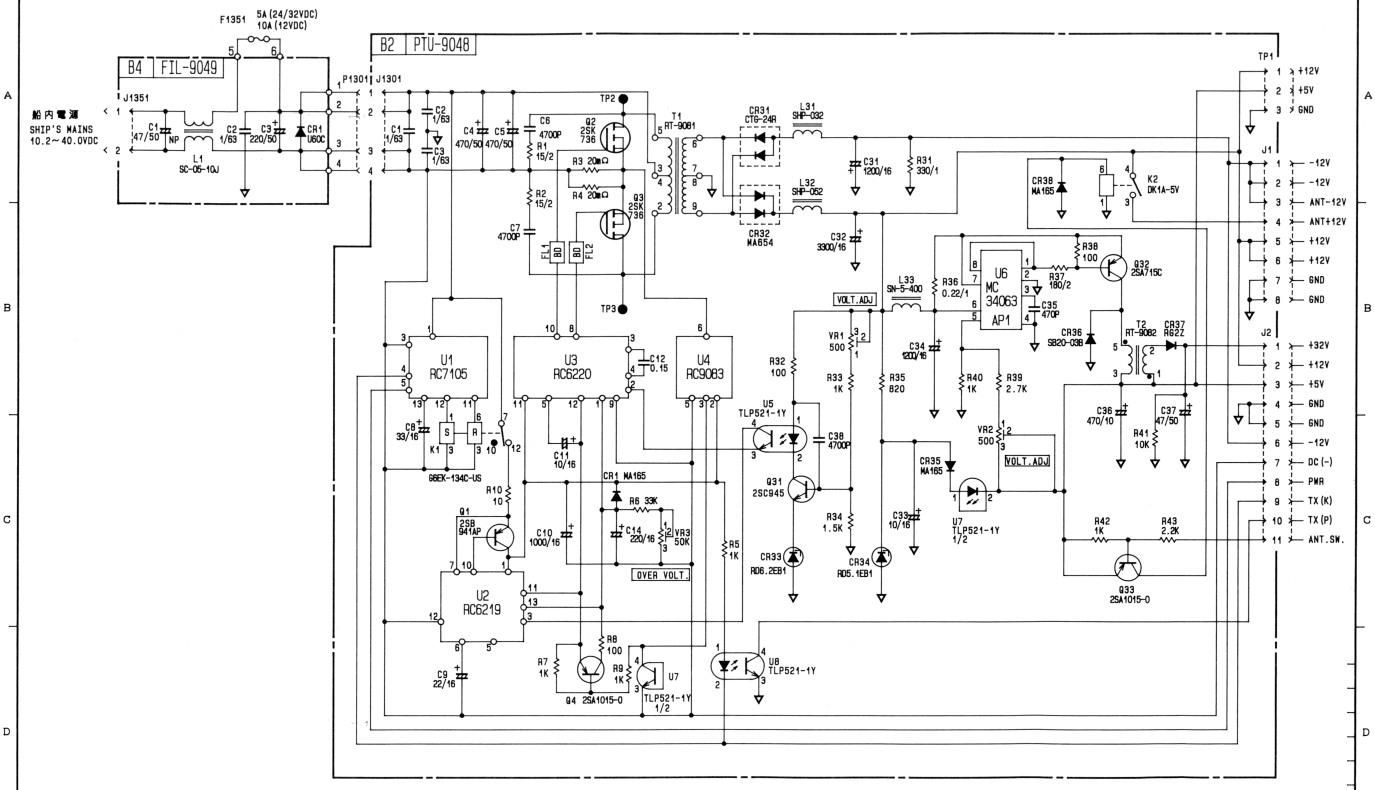
NOTE 1. 特記なき抵抗の単位は全てΩ, 0.25W 又コンデンサはμF.
ALL RESISTANCE IN OHMS, 0.25W, CAPACITANCE IN MICRO FARADS UNLESS NOTED OTHERWISE.

承認 APPROVED	AUG・3・'92 T.NAKANO	名称 TITLE	PTU-9047 電源基板 POWER SUPPLY
検図 CHECKED	AUG・3・'92 N.SAITO		FIL-9049 フィルター基板 FILTER
製図 DRAWN	AUG・3・'92 Y.HATAI	図番 DWG. NO.	C3359-K02-D

MODEL 1721

FURUNO ELECTRIC CO., LTD.

FURUNO



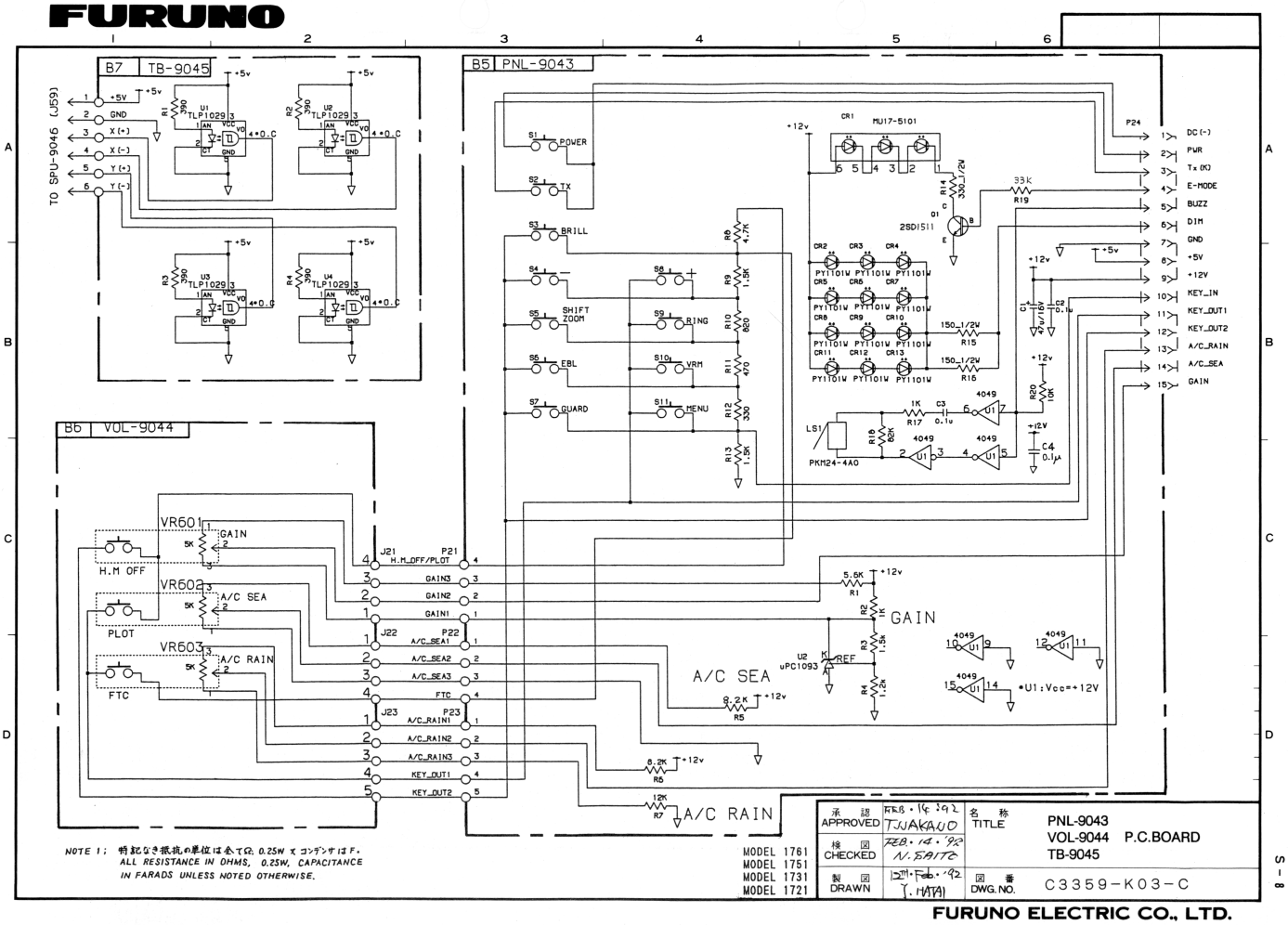
NOTE 1. 特記なき抵抗の単位は全てΩ, 0.25W 又コンデンサはμF.
ALL RESISTANCE IN OHMS, 0.25W, CAPACITANCE IN MICRO FARADS UNLESS NOTED OTHERWISE.

MODEL 1761
MODEL 1751
MODEL 1731

承認 APPROVED	AUG・3・'92 T.NAKANO	名称 TITLE	PTU-9048 電源基板 POWER SUPPLY
検図 CHECKED	AUG・3・'92 N.SAITO		FIL-9049 フィルター基板 FILTER
製図 DRAWN	AUG・3・'92 Y.HATAI	図番 DWG. NO.	C3360-K01-B

FURUNO ELECTRIC CO., LTD.

FURUNO



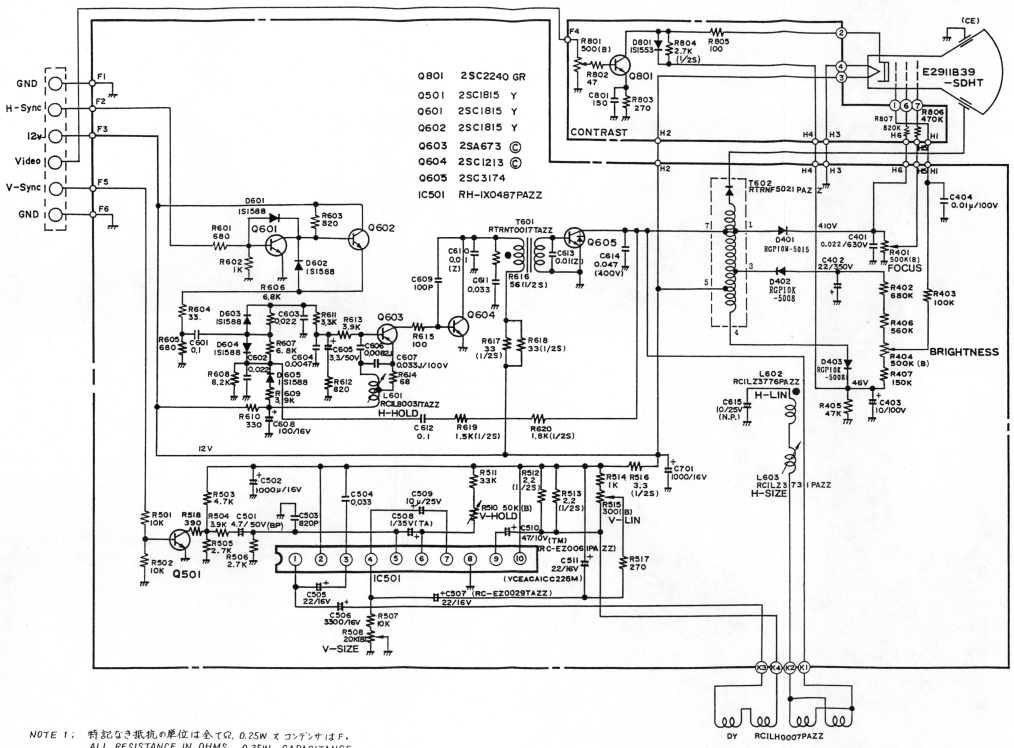
NOTE 1; 特記なき抵抗の単位は全てΩ, 0.25W x コンデンサはF.
ALL RESISTANCE IN OHMS, 0.25W, CAPACITANCE IN FARADS UNLESS NOTED OTHERWISE.

MODEL 1761
MODEL 1751
MODEL 1731
MODEL 1721

承認 APPROVED	FEB. 14 '92 T.NAKANO	名称 TITLE	PNL-9043 VOL-9044 P.C.BOARD TB-9045
検図 CHECKED	FEB. 14. '92 N.SAITO		
製図 DRAWN	13TH. Feb. '92 T. HATAI	図番 DWG. NO.	C3359-K03-C

FURUNO ELECTRIC CO., LTD.

FURUNO



NOTE 1; 特記なき抵抗の単位は全てΩ, 0.25W ヌ コンデンサはF.
ALL RESISTANCE IN OHMS, 0.25W, CAPACITANCE IN FARADS UNLESS NOTED OTHERWISE.

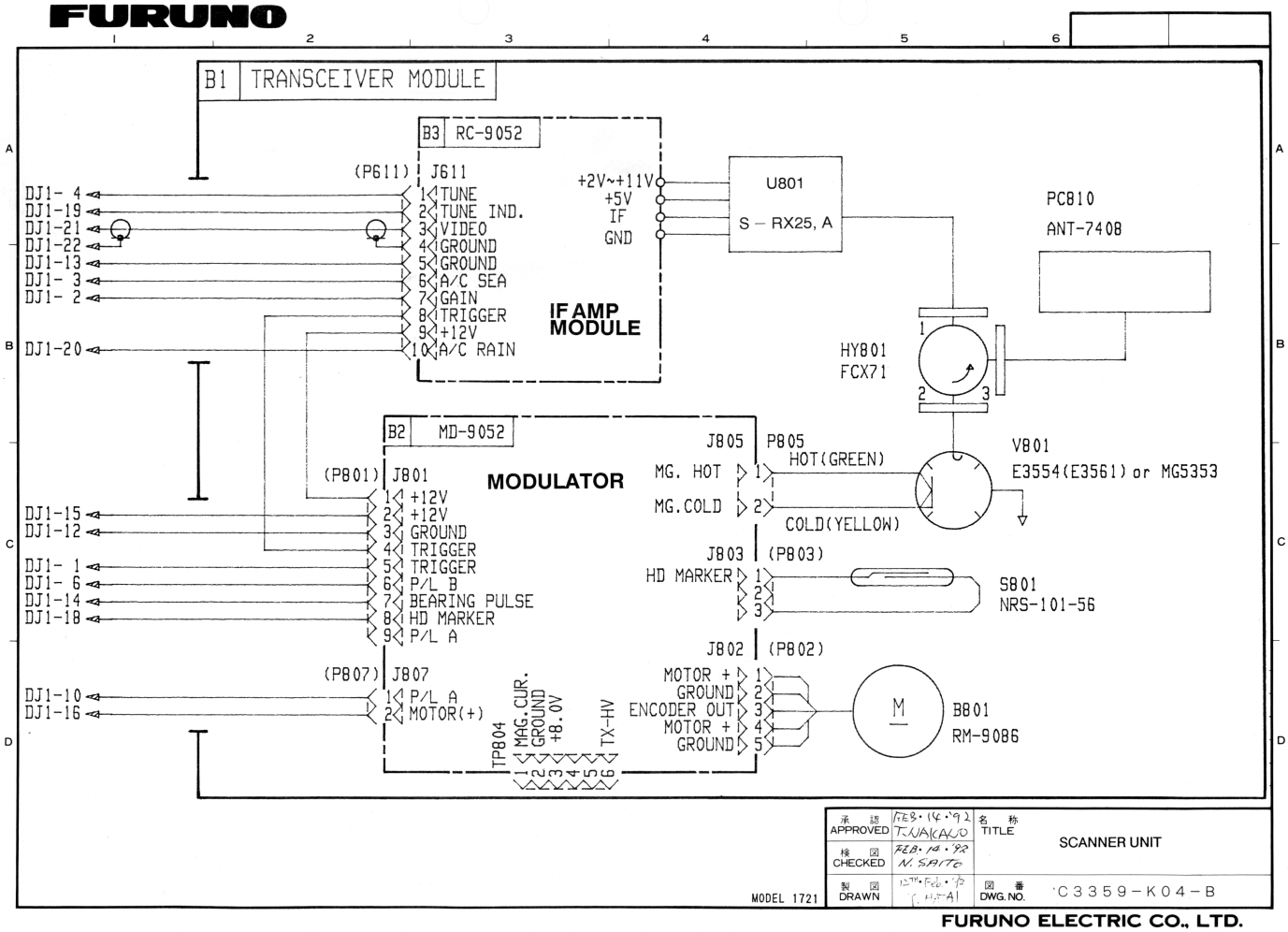
MODEL 1761
MODEL 1751
MODEL 1731
MODEL 1721
MODEL 1760
MODEL 1750
MODEL 1730
MODEL 1720

品番 ITEM	品名 NAME	材質 MATERIAL	数量 Q'TY	図番 DWG.NO.	摘要 REMARKS

承認 APPROVED	NOV.13.'87 T.WAKANO	三角法 THIRD ANGLE PROJECTION	名称 TITLE 7" モノクローム・ディスプレイ CRT DISPLAY (A1QA9DSP45)
検図 CHECKED	NOV.13.'87 I.AMANO	尺度 SCALE	
製図 DRAWN	NOV.13.'87 Y.HIRAI	重量 WEIGHT kg	図番 DWG.NO. C3309-010-F

FURUNO ELECTRIC CO., LTD.

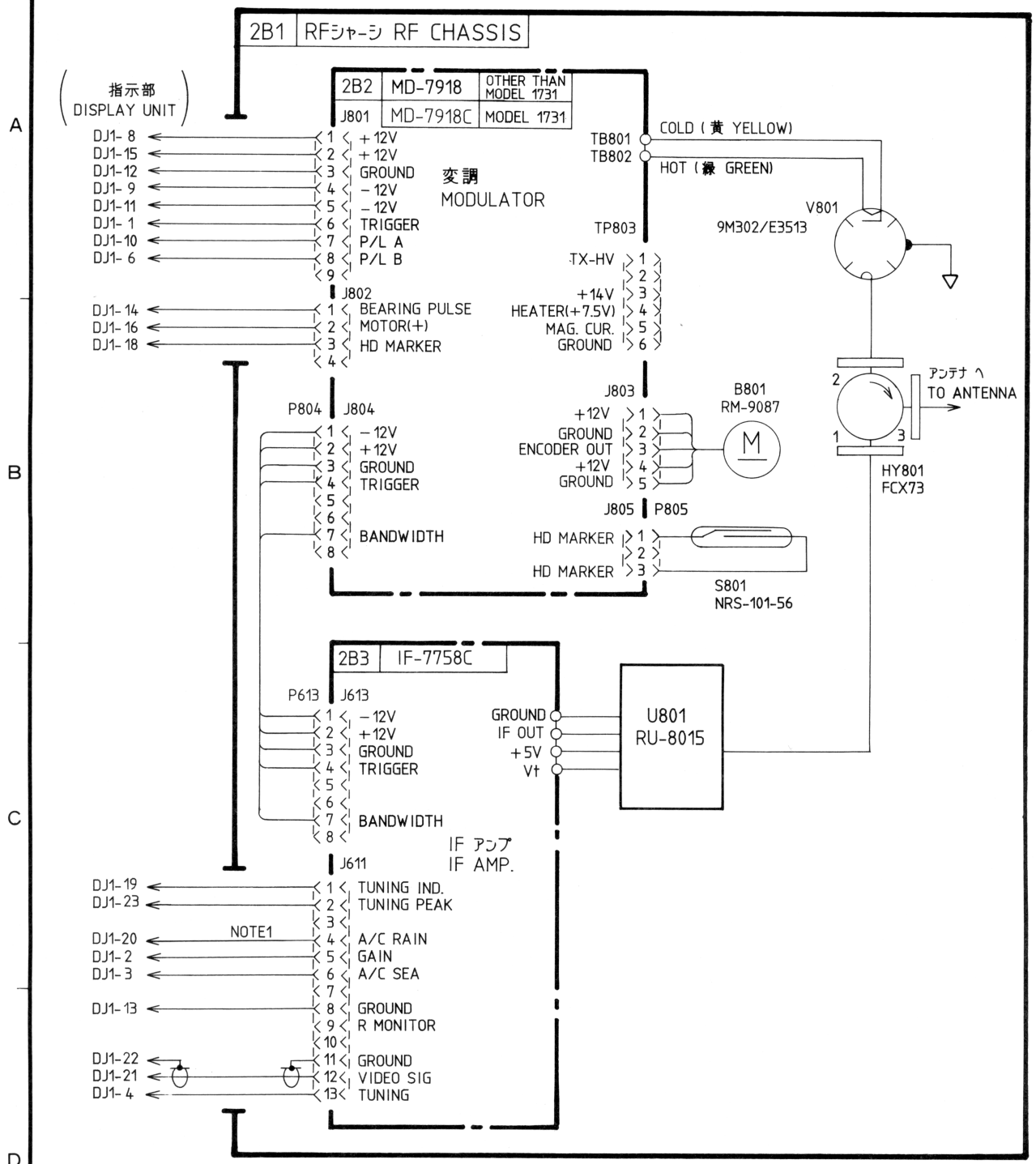
FURUNO



承認 APPROVED	FEB.14.'92 T.UJIKAWA	名称 TITLE	SCANNER UNIT
検図 CHECKED	FEB.14.'92 N.SAITO		
製図 DRAWN	12TH.Feb.'92 [illegible]	図番 DWG.NO.	C3359-K04-B

MODEL 1721

FURUNO ELECTRIC CO., LTD.



NOTE1. FR-7010D,FCR-1010, MODEL1731の場合のみ.MODEL1830/1730時は空き.
ONLY FOR FR-7010D,FCR-1010 AND MODEL1731,WHILE NO CONNECTION FOR MODEL1830/1730.

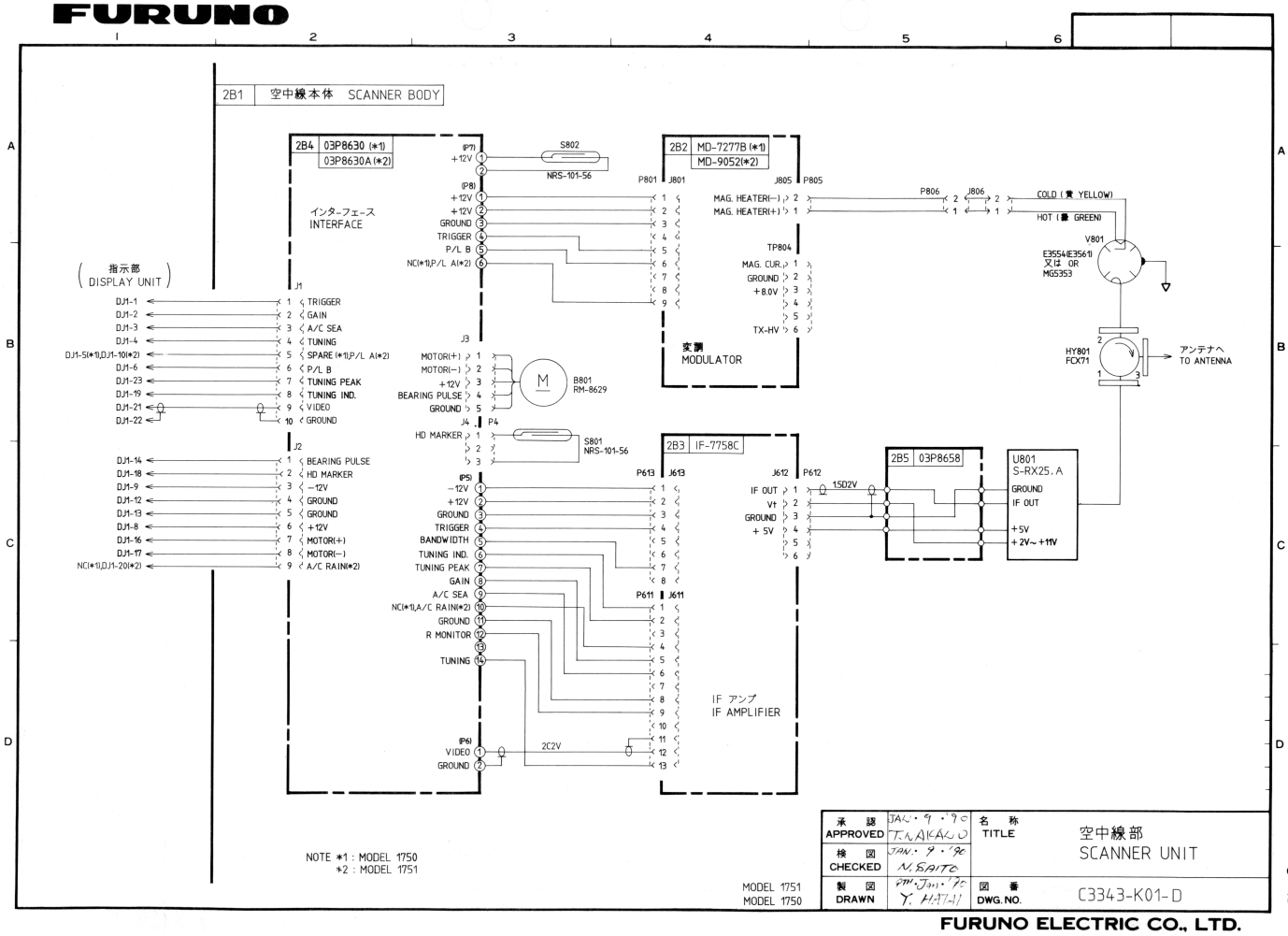
FCR-1010
MODEL 1730/1731
FR-7010D
MODEL 1830

品番 ITEM	品名 NAME	材質 MATERIAL	数量 Q'TY	図番 DWG.NO.	摘要 REMARKS

承認 APPROVED		三角法 THIRD ANGLE PROJECTION	名称 TITLE: 空中線部 SCANNER UNIT
検図 CHECKED		尺度 SCALE: /	
製図 DRAWN		重量 WEIGHT: kg	図番 DWG.NO.: C3319-K05-G

FURUNO ELECTRIC CO., LTD.

FURUNO



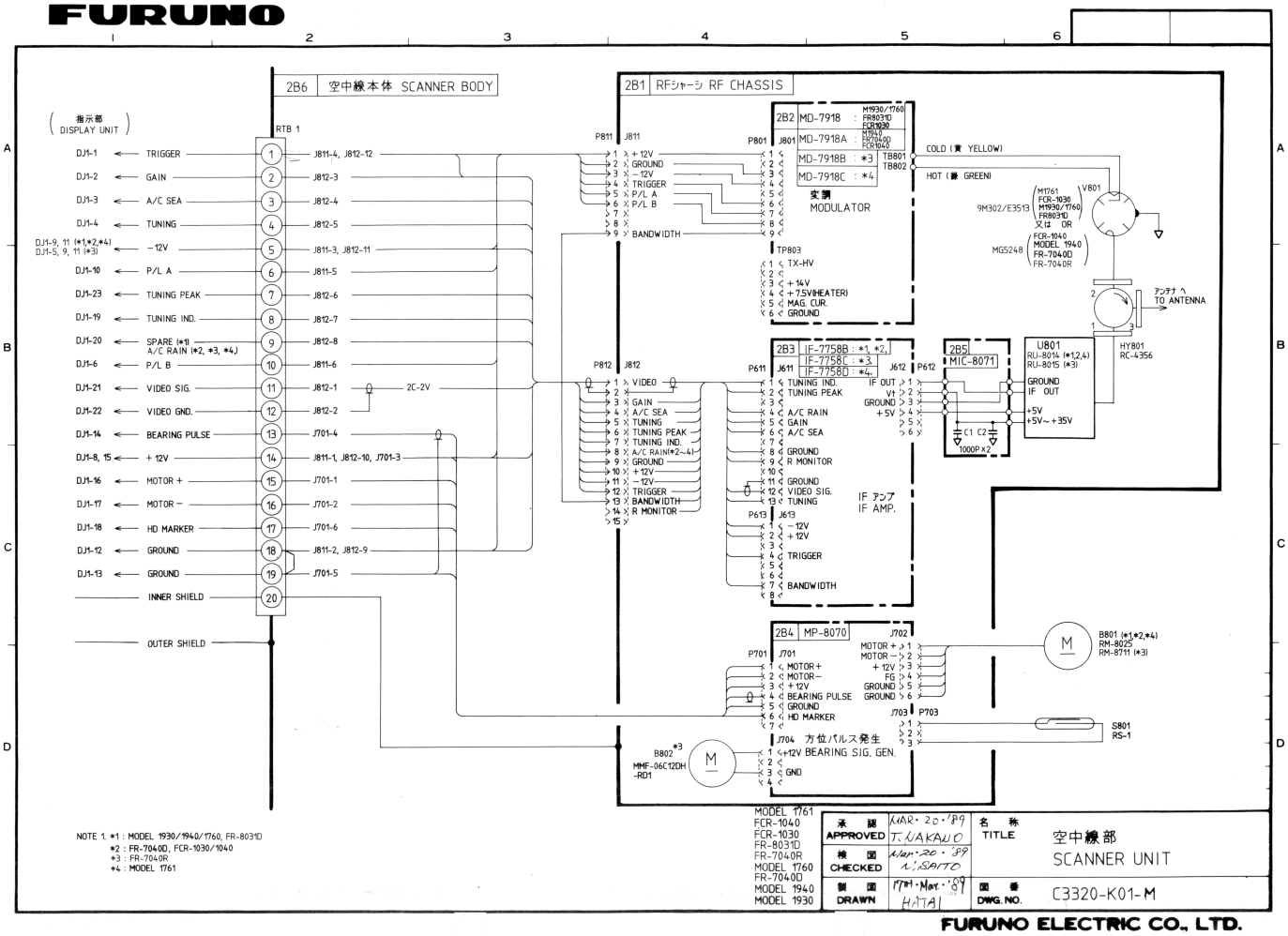
NOTE *1 : MODEL 1750
*2 : MODEL 1751

MODEL 1751
MODEL 1750

承認 APPROVED	JAN.9.'96 TAKAKU	名称 TITLE	空中線部 SCANNER UNIT
検図 CHECKED	JAN.9.'96 N.SAITO		
製図 DRAWN	JAN.9.'96 Y.HATTA	図番 DWG.NO.	C3343-K01-D

FURUNO ELECTRIC CO., LTD.

FURUNO

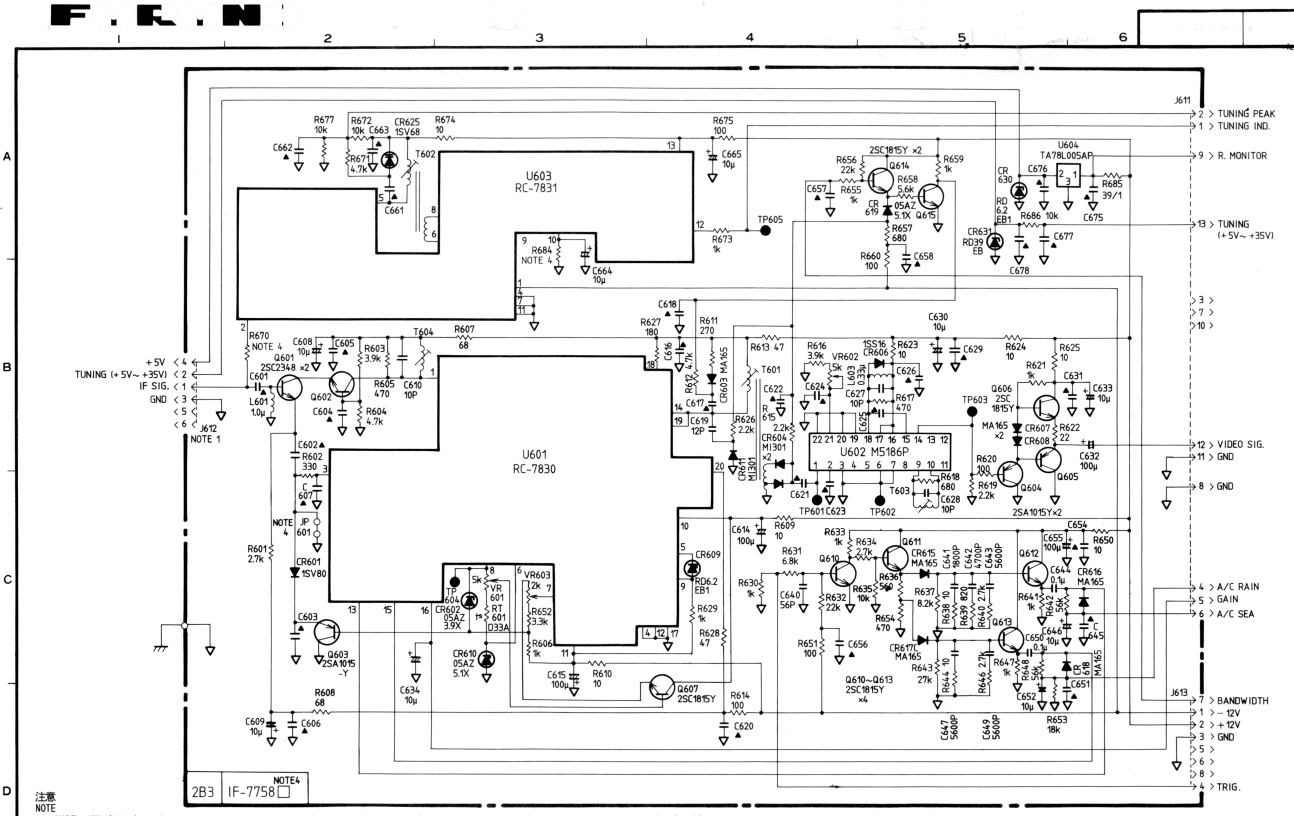


NOTE 1. *1 : MODEL 1930/1940/1760, FR-8031D
*2 : FR-7040D, FCR-1030/1040
*3 : FR-7040R
*4 : MODEL 1761

MODEL 1761
FCR-1040
FCR-1030
FR-8031D
FR-7040R
MODEL 1760
FR-7040D
MODEL 1940
MODEL 1930

承認 APPROVED	MAR. 20. '89 T. KAKANO	名称 TITLE	空中線部 SCANNER UNIT
検図 CHECKED	Mar. 20. '89 Y. SAITO		
製図 DRAWN	17TH. Mar. '89 HATA	図番 DWG. NO.	C3320-K01-M

FURUNO ELECTRIC CO., LTD.



注意
NOTE

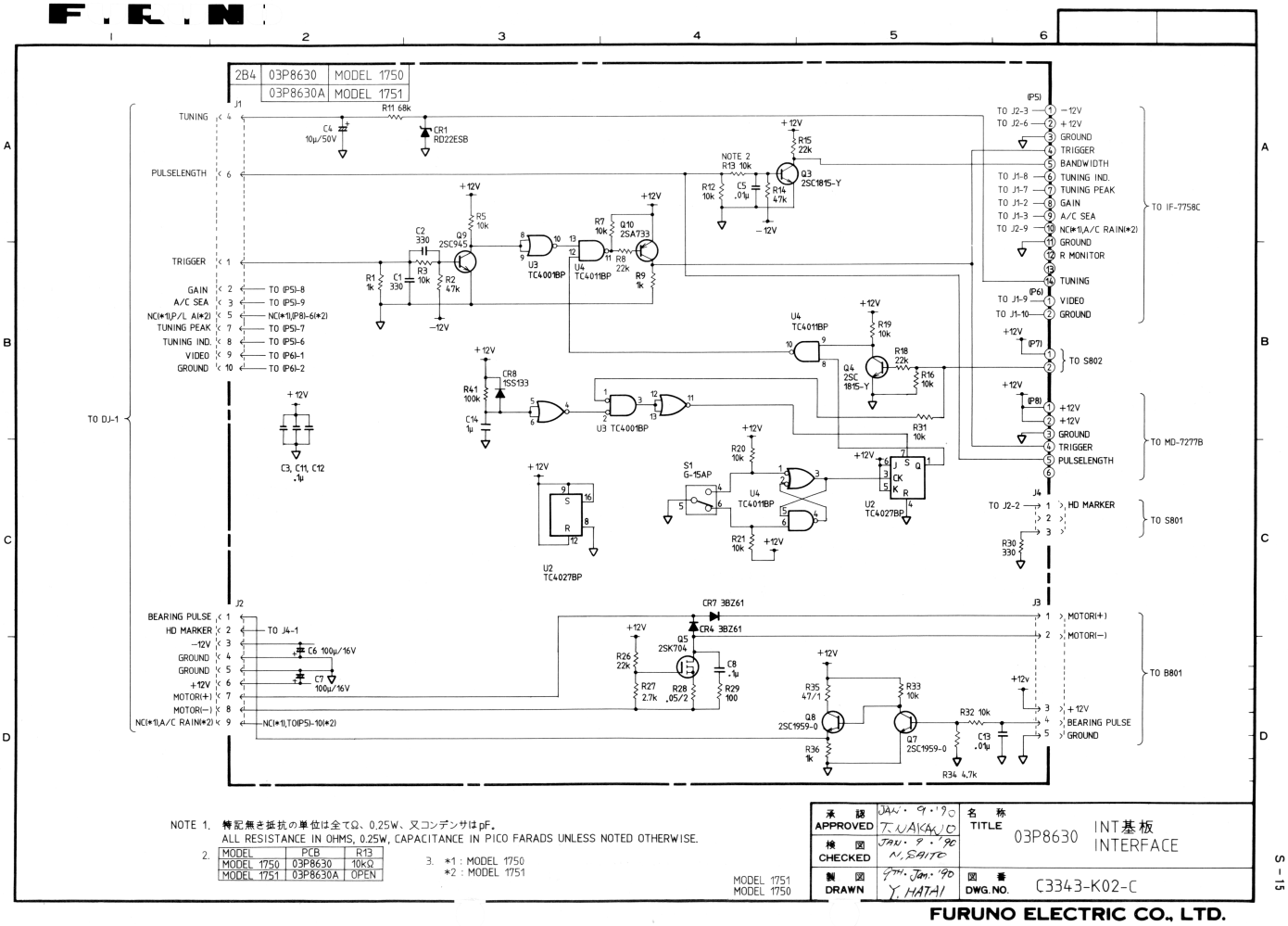
1. MODEL 1750/1751/1760/1761/1930/1940, FR-7040D/7040R/7100D, FCR-1040/1100時のみ。MODEL 1730/1731/1830, FR-7010D, FCR-1010時は半田付。
   J612 IS PROVIDED ONLY FOR MODEL 1750/1751/1760/1761/1930/1940, FR-7040D/7040R/7100D/8031D AND FCR-1030/1040/1100, WHILE FOUR LEAD WIRES ARE SOLDERED FOR MODEL 1730/1731/1830, FR-7010D AND FCR-1010.
2. 特記なき抵抗の単位は全てΩ, 1/6W コンデンサはF, コイルはH。
   ALL RESISTANCE IN OHMS 1/6W, CAPACITANCE IN FARADS AND INDUCTANCE IN HENRIES UNLESS NOTED OTHERWISE.
3. ▲: 1000pF, 50V.
4.

MODEL	PCB	JP601	R670	R684
MODEL 1730/1731/1750/1751/1830, FR-7010D/7040R, FCR-1010	IF-7758C	SHORT	5.6k	1.5k
MODEL 1760/1930/1940, FR-7040D/7100D/8031D, FCR-1030/1040/1100	IF-7758B	OPEN	8.2k	1.2k
MODEL 1761	IF-7758D	OPEN	4.7k	1.2k

MODEL 1830	FCR-1010
MODEL 1930	FCR-1030
MODEL 1940	FCR-1040
MODEL 1730	FCR-1100
MODEL 1750	FR-7010D
MODEL 1760	FR-7040D
MODEL 1731	FR-7040R
MODEL 1751	FR-7100D
MODEL 1761	FR-8031D

承認 APPROVED	Dec. 25. '89 T.NAKAGO	名称 TITLE	IF-7758 IFアンプ基板 IF AMPLIFIER
検図 CHECKED	Feb. 28. '89 N.SAITO		
製図 DRAWN	27th. Feb. '89 HATAI	図番 DWG. NO.	C3319-K07-K

FURUNO ELECTRIC CO., LTD.



NOTE 1. 特記無き抵抗の単位は全てΩ、0.25W、又コンデンサはpF。
ALL RESISTANCE IN OHMS, 0.25W, CAPACITANCE IN PICO FARADS UNLESS NOTED OTHERWISE.

2.

MODEL	PCB	R13
MODEL 1750	03P8630	10kΩ
MODEL 1751	03P8630A	OPEN

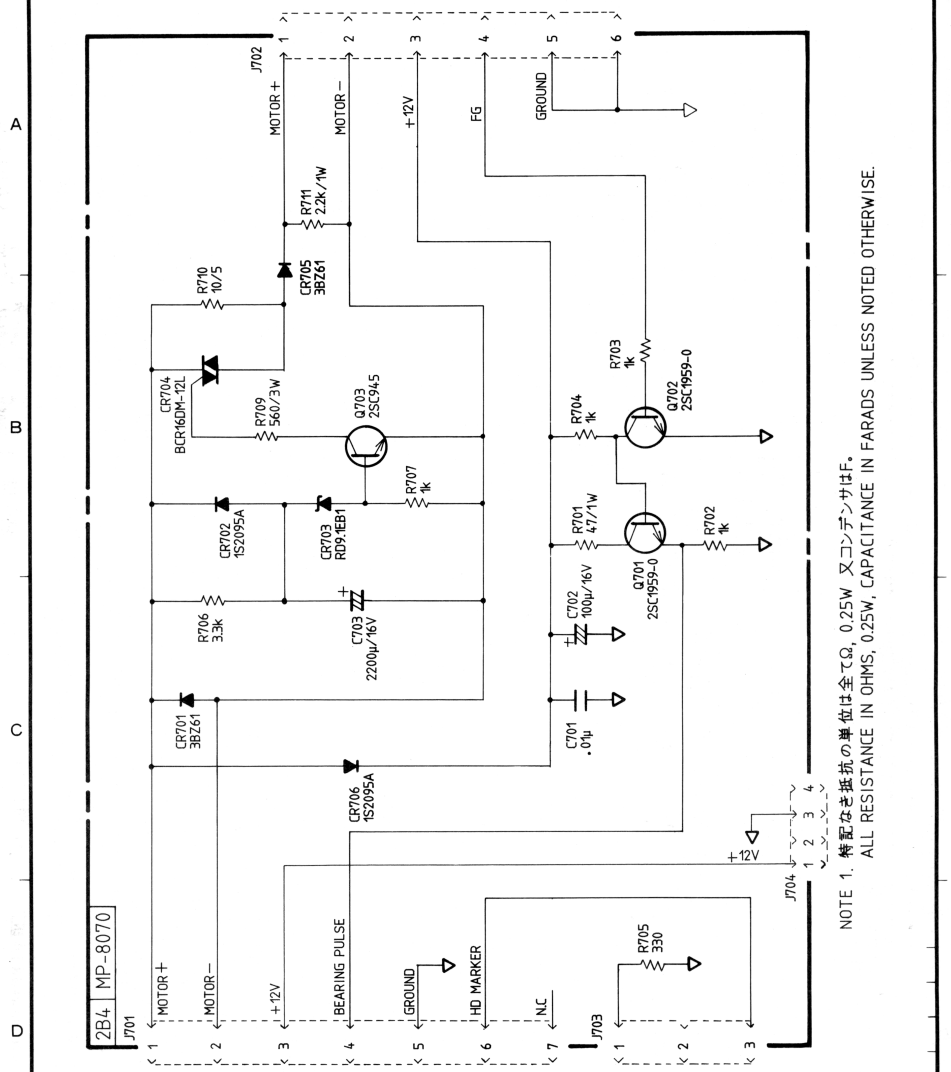
3. *1 : MODEL 1750
*2 : MODEL 1751

承認 APPROVED	JAN. 9.'90 T.NAKAJO	名称 TITLE	03P8630 INT基板 INTERFACE
検図 CHECKED	JAN. 9.'90 N.SAITO		
製図 DRAWN	9TH. Jan.'90 Y. HATAI	図番 DWG. NO.	C3343-K02-C

MODEL 1751
MODEL 1750

FURUNO ELECTRIC CO., LTD.

FURUNO



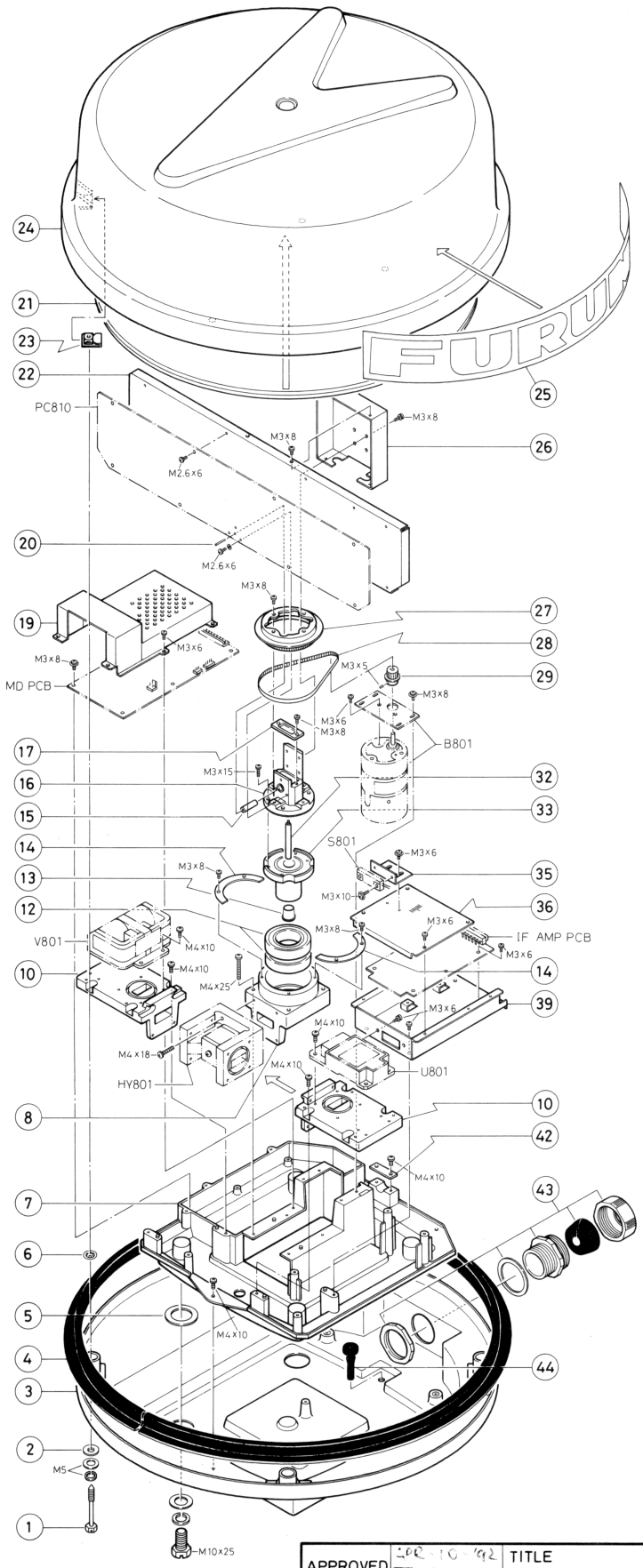
NOTE 1. 特記なき抵抗の単位は全てΩ, 0.25W 又コンデンサはF.
ALL RESISTANCE IN OHMS, 0.25W, CAPACITANCE IN FARADS UNLESS NOTED OTHERWISE.

MODEL 1761/1931/1941
FCR-1030/1040
FR-7040D/7040R/8031D
MODEL 1930/1940/1760

品番 ITEM	品名 NAME	材質 MATERIAL	数量 Q'TY	図番 DWG. NO.	摘要 REMARKS

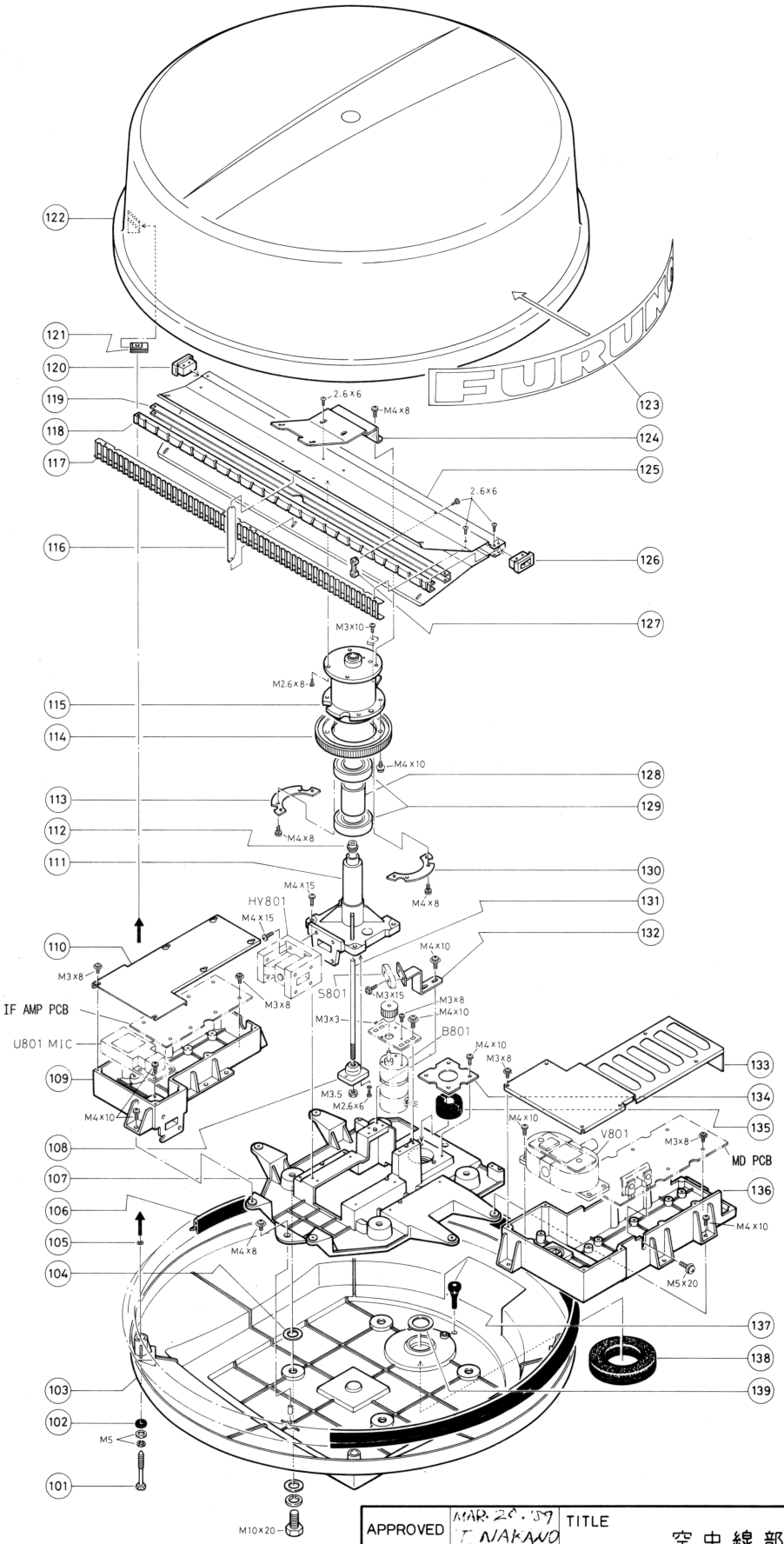
承認 APPROVED	SEP.14.'89 T.NAKAJO	三角法 THIRD ANGLE PROJECTION	名称 TITLE MP-8070 方位パルス発生基板 BEARING SIG. GEN.
検図 CHECKED	SEP.14.'89 N.SAITO	尺度 SCALE /	
製図 DRAWN	14TH.SEPT.	重量 WEIGHT kg	図番 DWG. NO. C3327-K02-G

FURUNO ELECTRIC CO., LTD.



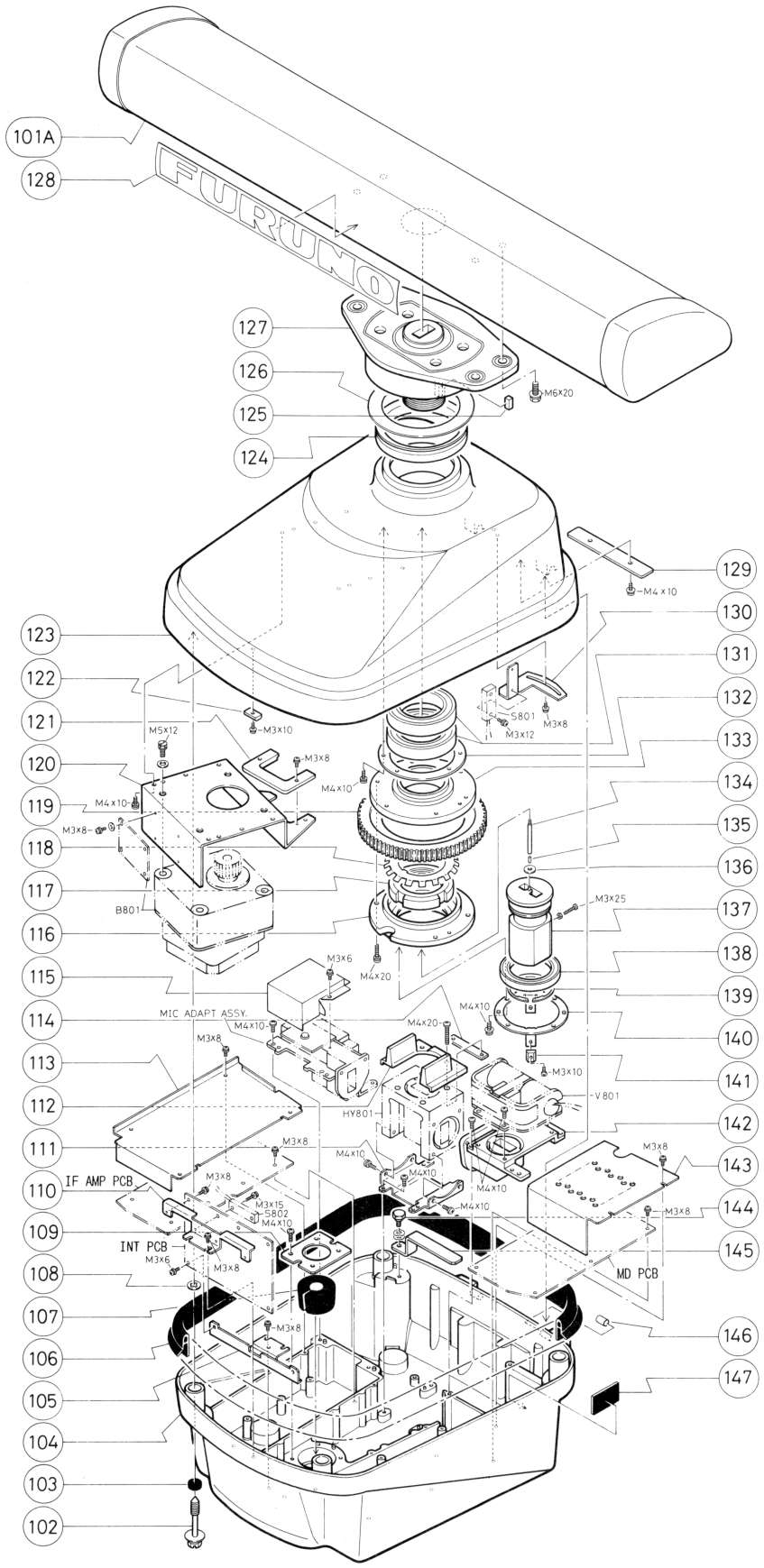
APPROVED	SEP 10 '92 T.NAKADO	TITLE	空中線部 SCANNER UNIT
CHECKED	APR. 10. '92 N. SAITO		
DRAWN	10TH April '92 Y. HATAI	DWG. NO.	C3359-E01-A

MODEL 1721



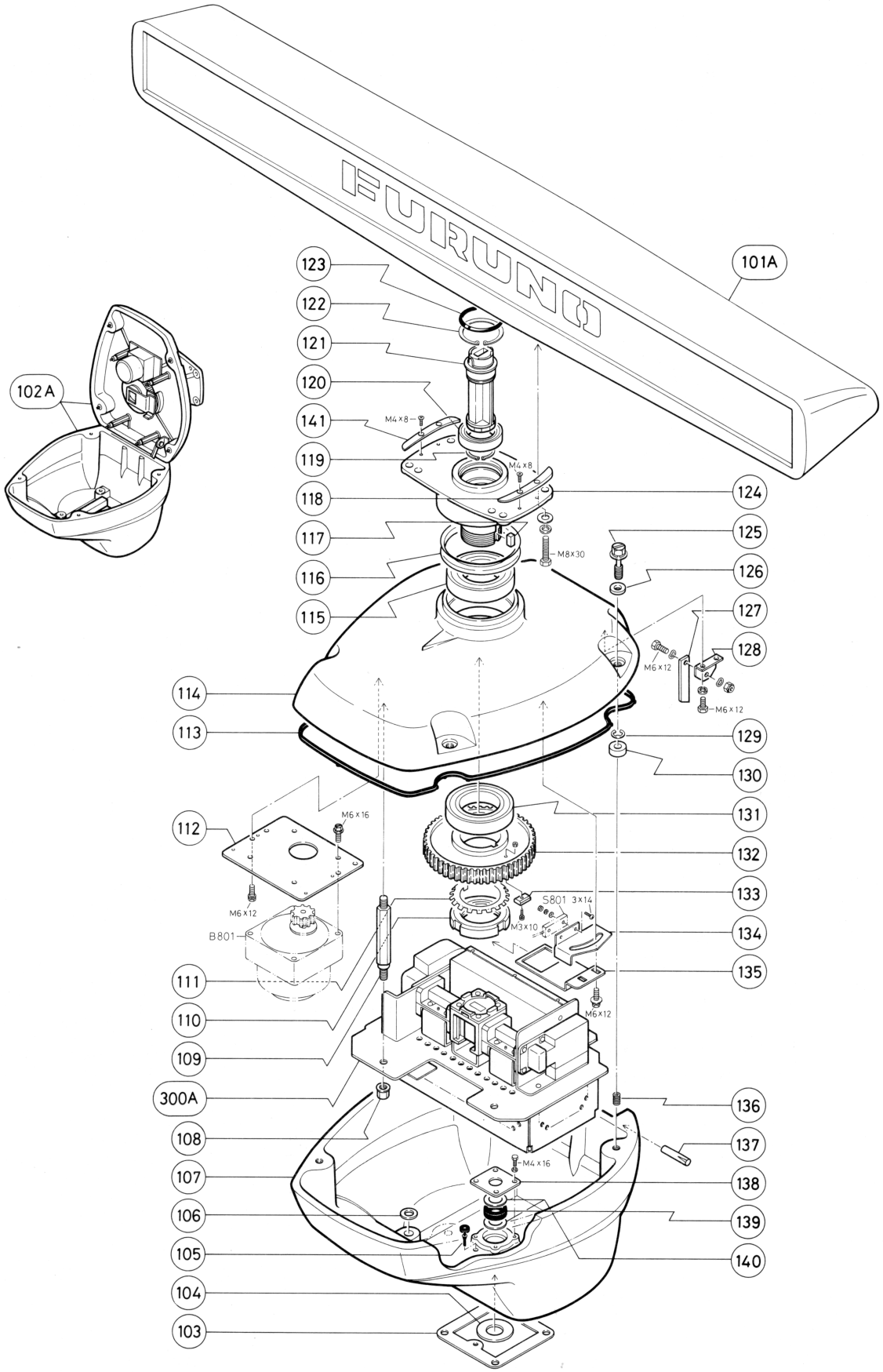
APPROVED	MAR. 20. '89 T. NAKANO	TITLE	空中線部 SCANNER UNIT
CHECKED	MAR. 20. '89 A. SAITO		
DRAWN	17TH MAR. '89 Y. HATAI	DWG. NO.	C3319-E02-D

MODEL 1731
FCR-1010 MODEL 1730
FR-7010D MODEL 1830



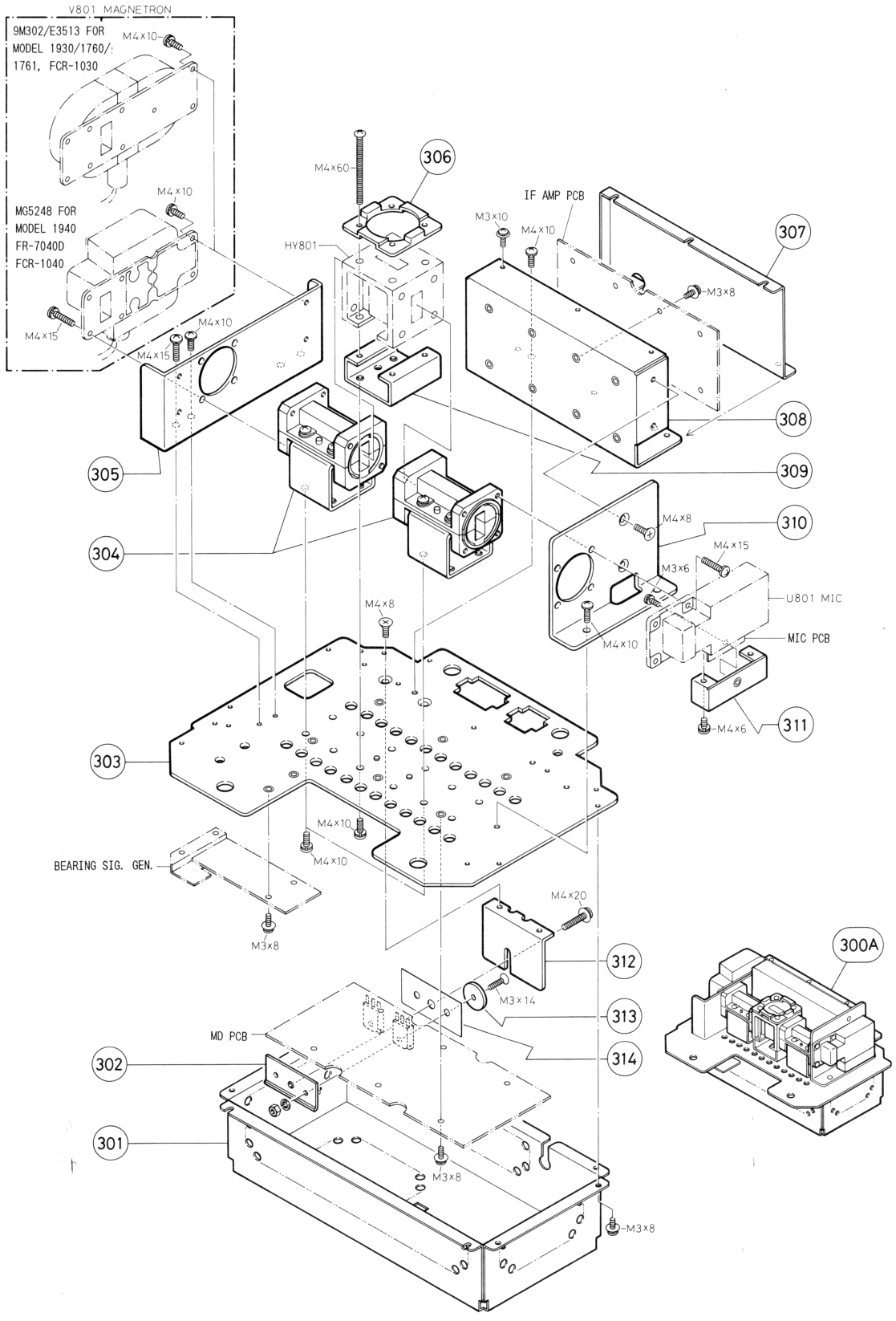
APPROVED	APR. 27. '10 T. NAKAMURA	TITLE	空中線部 SCANNER UNIT
CHECKED	APR. 27. '10 A. SAITO		
DRAWN	27TH. APR. '10 Y. H-17-11	DWG. NO.	C3343-E01-B

MODEL 1751
MODEL 1750



APPROVED	JUL·14·'89 T. KAKAKO	TITLE	空 中 線 部 SCANNER UNIT
CHECKED	JUL·14·'89 N. SAITO		
DRAWN	14TH·JUL·'89 Y. HATAI	DWG. NO.	C3320-E01-C

FCR-1030
MODEL 1761
MODEL 1760
MODEL 1930



FCR-1040
FCR-1030
MODEL 1761
MODEL 1760
FR-7040D
MODEL 1940
MODEL 1930

APPROVED	JUL.28.'97 T.KAKUO	TITLE	RFモジュール部 RF MODULE
CHECKED	JUL.28.'97		
DRAWN	JUL.28.'97 T.HITHI	DWG. NO.	C3327-E01-C

FURUNO ELECTRIC CO., LTD.

No. 9-52, ASHIHARA-CHO,
NISHINOMIYA-CITY, JAPAN

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TELEX : 5644-325/326 FURUNO J
TELEFAX : 0798-65-4200 (GⅡ/GⅢ)

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